Program: Certificate Course		Class	B.Sc I Year
dk;Zdze % izek.k i=		d{kk	ch-,Ilh izFke o"kZ
Subject fo"k;		Mathematics xf.kr	Paper No.: 1
Title of Paper	English	Algebra, Vector Analysis an	d Geometry (Paper : 1)
ikB~;Øe dk 'kh"kZd	fgUnh	chtxf.kr] lfn'k fo'ys"k.k ,oa T;kfefr ¼iz'ui= %1½	
Course Typ	be: Core	ikB~;Øe dk izdkj % dks	j dkslZ
Creadit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuks½
Total Mark	ks: 100	Max Marks: 30+70	Min Marks : 35
dqy vad %100		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
		Hkkx& v ifjp;	
iwokZis{kk		bl dkslZ dk v/;;u djus ds fy,] Nk= us fo"k; xf.kr dk v/;;u d{kk 12 oh esa fd;k gksA	
Pre-requisite		To study this course a student must have had the subject Mathematics in class $12^{\rm th}$	
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½ (CL0)		<ul> <li>ikB~;Øe Nk=ksa dks l{ke djsxk %</li> <li>1- vkO;wg dh tkfr dk mi;ksx djrs gq,] laoaf)Zr vkO;wg ds ifDar lksikud :i }kjk jSf[kd lehdj.kksa dh laxr vkSj vlaxr iz.kkfy;ksa dh igpku djus esaA</li> <li>2- ,d oxZ vkO;wg ds fy, vkbxsu eku vkSj laxr vkbxsu lfn'k dks Kkr djus esaA</li> <li>3- Ifn'k dyu ds Kku dks T;kfefr esa mi;ksx djus esaA</li> <li>4- f=foeh; T;kferh; vkd`fr;ksa ¼tSls 'kadq vkSj csyu½ ds fy, Kku esa o`f) djus esaA</li> </ul>	
Course Learning Outcomes(CLO)		The Course will enable the 1- Recognize Consistent a	Students to- nd Inconsistent systems of e row echelon form of the

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2- To find the Eigen values and corresponding Eigen
vectors for a square matrix
3- Using the knowledge of vector calculus in geometry.
4- Enhance the knowledge of three dimensional
geometrical figures (eg. Cone and cylinder).

	Part-B Content of the course			
Hkkx& c ikB~;Øe dh fo"k;oLrq				
Unit	Topics	Topics		
Unit 1	(English)	Historical background, Development of Indian Mathematics, Later classical period(500-1250), A brief biography of Varahamihira and Aryabhatta, Rank of matrix, Echelon and Normal form of matrix, Characteristics equations of a matrix, Eigen - values, Eigen-vectors.		
	¼fgUnh½	,sfrgkfld i`"BHkwfe] Hkkjrh; xf.kr dk fodkl] mŶkj fpjizfrf"Br dky ¼500&1250½] ojkgfefgj vkSj vk;ZHkV~V dh laf{klr thouh] vkO;wg dh tkfr] vkO;wg dk ,'ksyku ,oa izklkekU; :i] vkO;wg dk vfHkyk{kf.kd lehdj.k] vkbxsu eku] vkbxu lfn'kA		
Unit 2	(English)	Cayley Hamilton Theorem, Application of cayley Hamilton theorem to find the inverse of a matrix, Application of matrix to solve a system of linear equations,Theoremson consistency and inconsistency of a system of linear equations, Solving linear equations up to three unknows.		
	¼fgUnh½	dSyh gsfeYVu izes;] vkO;wg dk O;qRØe Kkr djus esa dSyh&gsfeYVu izes; dk vuqiz;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy, vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrrk ,oa vlaxrrk ij izes;] rhu vKkr jkf'k;ks ds jSf[kd		

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		lehdj.kksa ds gyA
Unit 3	(English)	Scalar and vector products of three and four vectors, Reciprocal vectors, vector differentiation, Rules of differentiation,Derivatives of triple products, Gradient, Divergence and curl, Directional derivatives, vectorIdentities, Vector Equations.
	l¼fgUnh½	rhu ,oa pkj lfn'kks dk vfn'k ,oa lfn'k xq.ku] O;qRØe lfn'k] lfn'k vodyu] vodyu ds fu;e] f=d xq.kuQyks ds vodyt] xzsfM;aV] Mk;ojtsal ,oa dyZ] fnd~ vodyt] lfn'k loZlfedk,a] lfn'k lehdj.k
Unit 4	(English)	Vector integration, Gauss theorem(without proof) and problems based on it, Green theorem(without proof) and problems based on it, Stoke theorem(without proof) and problems based on it.
	¼fgUnh½	lfn'k lekdyu] xkWl izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'u] xzhu izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'u] LVksd izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'uA
Unit 5	(English)	General equation of second degree, Tracing of conics, System of conics, cone, Equation of cone with given base, Generators of cone, Condition for three mutually perpendicular generators, Right circular cone, Cylinder, Equation of cylinder and its properties Right circular cylinder, Enveloping cylinder,
	¼fgUnh½	f}rh; ?kkr dk O;kid lehdj.k] 'kkadoks dk vuqjs[k.k] 'kkadoks dk fudk;] 'kadq] fn, x, vk/kkj ds lkFk 'kadq dk lehdj.k] 'kadq ds tud] rhu ijLij yEcor tudksa gsrq izfrca/k] yEco`Ÿkh; 'kadq] csyu] csyu dk lehdj.k vkSj mlds izxq.k] yEco`Ÿkh; csyu] vUokyksi csyuA

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	Part-CLearning Resources
	Hkkx I vuq'kaflr v/;;u lalk/ku
	Text books. Reference books, other resourse
	ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku
<b>Suggested</b>	Readings:
vuq'kaflr lo	gk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh:
ikB~;iqLrd	s%
1- K.B.Datta 2000	a, Matrix and Linear Algebra prentice hall of india Pvt Ltd New Delhi
2- Shanti Na	arayan: A text Book of vector Calculus . S. Chand & co. New Delhi1987
3- S.L.Loney	y: The Elements of Coordinate Geometry part 1. New age
Internati	onal(P) Ltd., Publishers, New Delhi 2016.
4- P.K. Jain	and Khalil Ahmad: A text book of Analytical Geometry of three
Dimensio	ons, Willey Eastern Ltd. 1999.
5- Gerard G	. Emch. R. Sridharan. M. D. Srinivas Contribution to the History of
Indian M	athematics, Hindustan Book Agency, Vol.3.2005.
6- e/·izns'k	xazEk vdkneh dh igl rdsaA

6- e/;izns'k xazFk vdkneh dh iqLrdsaA

#### Reference Books; lanHkZ iqLrdsa ;

- 1- Chandrika Prasad: A Text Book on Algebra and Theory of Equations, Pothishala Pvt Ltd, Allahabad, 2017.
- 2- N. Jocobson: Basic Algebra Vol.I and II, W.H.Freeman. 2009.

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- 3- I.S.Luther and I.B.S. Passi : Algebra Vol. I and II Narosa publishing House, 1997.
- 4- N. Saran and S.N.Nigam Introduction to vector Analysis. Pothishala Pvt Ltd. Allahabad.1990.
- 5- Murray R Spiegel: vector Analysis Schaum Publishing Company , New York, 2017.
- 6- Gorakh Prasad and H.C.Gupta: Text book on Coordinate Geometry Pothishala Pvt Ltd Allahabad, 2000.
- 7- P.K.Jain and Khalil Ahmad: A text book of Analytical Geometry of Two dimensions Macmillan India Ltd. 1994.
- 8- S.L.Loney. The Elements of Coordinate Geometry Part-2 Macmillan, 1923.
- 9- N.Saran and D.N.Gupta Three Dimensional Coordinate Geometry Pothishala Pvt Ltd,. Allahabad, 1994.
- 10- R.J.T. Bell: Elementary Treatise on coordinate Geometry Of Three Dimensions Macmillan India Pvt Ltd, 1994.
- 11- Bibhutibhusan Datta and Avadesh Narayan singh: History of Hindu Mathematics, Asia Publishing House, 1962.

#### vuq'kaflr fMftVy lysVQkeZ osc fyad%

#### Suggested Digital platforms Web Links;

https;//epgp.inflibnet.ac.in

https;//freevideolectures.com/university/iit-roorkee

https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D https;//www.Bhojvirtualuniversity.com

#### vuq'kaflr led{k vkWuykbu ikB;Øe

#### Suggested Equivalent Online Courses;

https;//nptel.ac.in/courses/111105122/

https;//nptel.ac.in/courses/111107112/

https;//nptel.ac.in/courses/111/101/111101080/

PART-D A	Assessment and Evaluation			
Suggested C Maximum Marks: : 100 Continuous comprehensive Evalu Exam : :70	Continuous Evaluation Methods	:		
Internal Assessment: Continuous comprehensive	Class Test Assignment /Presentation	20 10		
Evaluation(CCE) External Assessment: Exam	Section (A) Three very Short Questions (50 Words Each)	Total Marks =30		
Time: 03.00 Hours	Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)			
		Total=70		
H <u>kkx n vuq'kaflr ewY;kdau fof/k;ka</u> vuq'kaflr lrr~ ewY;kdau fof/k;ka				
vf/kdre vad:	100			
Irr~ O;kid ewY;kdau(CCE): ijh{kk :	30 70			

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vkarfjd ewY;kdau Irr~ O;kid ewY;kdau(CCE)	Dykl VsLV vlkabuesaV @ izLrqfrdj.k¼isztsuVs'ku½	20 10 dqy ;ksx= 30
vkdyu% ijh{kk le;% 03.00?kaVs	vuqHkkx¼v½rhu vfr y?kq iz'u¼izR;sd 50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	
		Total= 70

Program :Certificate Course		Class	B.Sc I Year	
dk;Zdze % izek.k i=		d{kk	ch-,Ilh izFke o"kZ	
Subject		Mathematics	Dapar No. 2	
fo"k;		xf.kr	Paper No.: 2	
Title of Paper	English	Calculus and Differential	Equations (Paper 2)	
ikB~;Øe dk 'kh"kZd	fgUnh	dyu ,oa vody lehdj.k ¼iz'ui= %2½		
Course Type :Core		ikB~;Øe dk izdkj% dksj dkslZ		
Credit	Theory : 6	Medium of Teaching	English and Hindi (Both)	
ØsfMV eku	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuks½	
Total Marks : 100		Max Marks: 30+70	Min Marks : 35	
		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35	
Hkkx& v ifjp;				
iwokZis{kk		bl dkslZ dk v/;;u djus ds fy,] Nk= us fo"k;		

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	xf.kr dk v/;;u d{kk 12 oh esa fd;k gksA
Pre-requisite	To study this course a student must have had the subject Mathematics in class 12 <sup>th</sup>
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½	<ul> <li>ikB~;Øe Nk=ksa dks l{ke djsxkA</li> <li>1- fofHkUu lanfHkZr funsZ'kkad i)fr;ksa esa xf.krh; izxq.kks dk mi;ksx djrs gq, ,d lery esa oØksa dks js[kkafdr djus esaA</li> <li>2- vuqdwyu lkekftd foKku HkkSfrdh vkSj thou foKku vkfn esa vodyt dk mi;ksx djus esaA</li> <li>3- fofHkUu xf.krh; izfr:iksa ds fy, vody lehdj.k lw=c) djus esaA</li> <li>4- fofHkUu xf.krh; izfr:iksa dks gy djus vkSj mudk fo'ys"k.k djus ds fy, rduhdksa dk mi;ksx djus esaA</li> </ul>
Course Learning Outcome's(CLO)	<ul> <li>The course will enable the students to-</li> <li>1- Sketch curves in a plane using its Mathematical properties in the different coordinate systems of reference.</li> <li>2- Using the derivatives in Optimization social sciences, Physics and Life sciences etc.</li> <li>3- Formulate the differential Equationfor various Mathematical models.</li> <li>4- Using techniques to solve and analyze various Mathematical models.</li> </ul>

Part-B Content of the course			
Hkkx& c ikB~;Øe dh fo"k;oLrq			
Unit	Syllabus		
Unit 1	(English)	Historical Background, Development of Indian Mathematics, Ancient and Early classical period till (500 CE), A brief biography of Bhaskaracharya (with special reference to Lilavati) and Madhava, Successive differentiation, Leibnitz theorem, Maclaurin's series Expansion, Taylor's series Expansion, Partial	

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	<sup>1</sup> / <sub>4</sub> fgUnh <sup>1</sup> / <sub>2</sub>	Differentiation : Partial Derivatives of higher Order, Euler's theorem on Homogeneous functions, Asymptotes: Asymptotes of Algebraic Curves, condition for Existence of Asymptotes, Parallel Asymptotes, Asymptotes of polar curves. ,sfrgkfld i`"BHkwfe] Hkkjrh; xf.kr dk fodkl] izkphu vkSj izkjafHkd fpjizfrf"Br dky ¼500 lhbZ rd½] HkkLdjkpk;Z ¼yhykorh ds fo'ks"k lanHkZ esa½vkSj ek/ko dh laf{klr thouh] mŸkjksŸkj vodyu] ySouht izes;] eSDykfju Js.kh }kjk foLrkj] Vsyj Js.kh }kjk foLrkj] vkaf'kd vodyu] mPp dksfV ds vkaf'kd vodyt] le?kkr Qyuksa ij vk;yj izes;] vuarLi'khZ chth; oØks dh vuarLif'kZ;ki] vuarLi'khZ ds vfLrRo gksus dk izfrcU/k] lekUrj vuarLif'kZ;kjA
	(English)	Curvature: Formula for Radius of curvature, Curvature at Origin, Centre of Curvature, Concavity andConvexity: Concavity and Convexity of curves, Point of inflexion, Singular point, Multiple points, Tracing of curves: curves represented by Cartesian equation, Curves represented by Polar equation,
Unit 2	¼fgUnh½	oØrk & oØrk f=T;k ds fy; lw=] ewy fcUnq ij oØrk] oØrk dsUnz] mŸkyrk ,oa voryrk& oØkas dh mŸkyrk ,oa voryrk] ufr ifjorZu fcUnq] fofp= fcUnq] cgqy fcUnq] oØks dk vuqjs[k.k&dkrhZ lehdj.kksa }kjk fu:fir oØ] /kzqoh; lehdj.kksa }kjk fu:fir oØA

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	1	
	(English)	Intregration of transcendental functions, Introduction
		to Double and Triple Integral, Reduction formulae,
		Quadrature: for Cartesian coordinates, for polar
		coordinates, Rectification: for Cartesian coordinates,
		For polar coordinates,
Unit 3	l¼fgUnh½	vCkhth; Qyuksa dk lekdjyu] f}d ,oa f=d
		lekdy dk ifjp;] leku;u lw=] {ks=dyu]
		dkrhZ; funsZ'kkadks ds fy,] /kqohZ;
		funsZ'kkadks ds fy,]
		pkidyu & dkrhZ; funsZ'kkadks ds fy,]
		/kqzoh; funsZ'kkadks ds fy,A
	(English)	Linear Differential equations: linear equation,
		Equations reducible to the Linear form, Change of
		variables, Exact differential equations, First order and
		Higher degree differential equations: Equations
		solvable for x, y and p, Equations homogenous in x
		and y, Clairaut's Equation, Singular Solutions,
		Geometrical meaning of differential equations,
		Orthogonal trajectories.
Unit 4	(fgUnh)	jSf[kd vody lehdj.k% jSf[kd lehdj.k]
		jSf[kd lehdj.k esa lekus; vody lehdj.k]
		pjksa dk ifjorZu] ;FkkrFk vody lehdj.k]
		izFke dksfV ,oa mPp ?kkrh; vody
		lehdj.k% x, y vkSj p esa gy gksus
		;ksX;A <i>x</i> vkSj <i>y</i> esa le?kkr lehdj.k] Dysjks
		dk lehdj.k] fofp= gy] vody lehdj.kksa ds
		T;kferh; vFkZ] ykfEcd laaNsfn;kaA
	(English)	Linear differential equation with constant coefficients,
		Homogeneous Linear ordinary differential equations,
Unit 5		Linear differential equations of second order,
		Transformation of equations by changing the
		dependent / independent variable, Method of variation
		of parameters.

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(fgUnh)	vpj xq.kkadks okys jSf[kd vody lehdj.k] lk/kkj.k jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd vody lehdj.k] ijra=@ Lora= pj ds ifjorZu }kjk lehdj.kksa dk :ikUrj.k] izkpy fopj.k fof/kA
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#### Part-C

Text books. Reference books, other resourse

Hkkx I vuq'kaflr v/;;u lalk/ku

ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

#### Suggested Readings: vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh: ikB~;iqLrds%

- 1-Gorakh Prasad: Differential calculus, Pothishala Private Ltd. Allahabad, 2016
- 2- Gorakh Prasad: Integral Calculus, Pothishala Private Ltd. Allahabad, 2015
- **3-** M.D. Raisinghania: Ordinary and Partial Differential equation, S.chand & Co. Ltd. 2017
- **4-** Gerard G: Emch. R.Sridharan and M.D. Srinivas, contributions of the History of Indian Mathematics, Hindustan Book Agency. Vol.3. 2005.
- 5-e/;izns'k xazFk vdkneh dh iqLrdsaA

#### Reference Books; lanHkZ iqLrdsa ;

- 1-N.Piskunov: Differential and Integral Calculus, CBS. Publisher 1996.
- **2-**G.F. Simmons: Differential equation. Tata McGraw Hill 1972.
- **3-**E.A.Codington: An Introduction to Ordinary differential equations. Prentice Hall of India. 1961.
- **4-**D.A. Murray: IntroductoryCourse in Differential Equations. Orient Longman India (1967).
- **5-**H.T. H Piaggio: Elementary Treatise on Differential Equations and their Applications C.B.S. Publisher & Distributors. Delhi. 1985.
- 6-Bibhutibhusan Datta and Avadesh Narayan Singh History of Hindu Mathematics,

#### Asia Publishing House, 1962 vuq'kaflr fMftVy lysVQkeZ osc fyad% Suggested Digital platforms Web Links;

https;//epgp.inflibnet.ac.in

https;//freevideolectures.com/university/iit-roorkee

https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D

https;//www.bhojvirtualuniversity.com

#### vuq'kaflr led{k vkWuykbu ikB;Øe

#### **Suggested Equivalent Online Courses;**

https;//nptel.ac.in/courses/111106100/ https;//nptel.ac.in/courses/111/101/111101080/

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PART-D Assessment and Evaluation					
Suggested (	Suggested Continuous Evaluation Methods:				
Maximum Marks: : 100					
Continuous comprehensive Eval	uation(CCE): 30				
Exam : :70					
Internal Assessment:	Class Test		20		
Continuous comprehensive	Assignment /Presentation		10		
Evaluation(CCE)		Total N	larks =30		
External Assessment:	Section (A) Three very Short				
Exam	Questions (50 Words Each)				
Time: 03.00 Hours	Section (B) Four Short Questions (200 Words Each)				
	Section (C) Two Long Questions				
	(500 Words Each)				
Τα			otal=70		
	vuq'kaflr ewY;kdau fof/k;ka				
vuq'kaflr lrr~ ewY;kdau fof/k;ka					
vf/kdre vad: 100					
Irr~ O;kid ewY;kdau(CCE):	30 70				
ijh{kk : vkarfjd ewY;kdau	Dykl VsLV		20		
	vlkabuesaV @				
Irr~ O;kid	-	1/	10		
ewY;kdau(CCE)	izLrqfrdj.k¼isztsuVs'ku	<b>'</b> /2	dqy ;ksx= 30		
vkdyu%	vuqHkkx¼v½rhu vfr y?kq iz'u¼i	zR;sd			
ijh{kk le;%03.00?kaVs	50 'kCn½				
	vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd				
	200 'kCn½				
	vuqHkkx $\frac{1}{12}$ nks nh?kZ iz'u $\frac{1}{12}$	zR;sd			
	500 'kCn½				

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	Total= 70

Program: Certificate Course		Class		B.Sc I Year		
dk;Zdze % izek.k i=		d{kk		ch-,Ilh izFke o"kZ		
Subject				Mathematics		
fo"k;				xf.kr		
Course Type		B∼;Øe dk dkj		Elective-1	0	SdfYid&1
Title of Pape	er	English		Matrices, Geometry and V	Vec	ctor Algebra
ikB~;Øe dk 'kh"kZd		fgUnh		vkO;wg] T;kfefr ,oa la	afı	n'k chtxf.kr
Credit		Theory : 6		Medium of Teaching	E	nglish and Hindi (Both)
ØsfMV eku	r	LkSa)kfrd %6		f'k{k.k dk ek/;e		gUnh ,oa vaxzsth 4nksuks½
Total M	arl	ks: 100		Max Marks: 30+70		Min Marks : 35
			vf/kdre vad % 30+70		U;wure mRRkhZ.k vad %35	
	Hkkx v & ifjp;					
iwokz	Zis	{kk	bl	ol ikB~;Øe dks mu lHkh fo"k;ksa ds		
g		g g	o kfFkZ;ksa }kjk oSdfYid ds :i eas pquk tk ldrk gS ftuds ikl 12oha Lrj ij xf.krh; i`"BHkwfe ugha gSA			
of		-		an Elective by the Students e Mathematical Background		

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ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½	fo kFkhZ] O;olk; vkSj foKku ds fofHkUu {ks=ksa tSls ctV] fcØh iz{ksi.k] ykxr vuqeku] iz;ksx ds ifj.kkeksa dk fo'ys"k.k vkfn esa vkO;wg] lkjf.kd] T;kfefr vkSj lfn'k n`f"Vdks.k dk mi;ksx djus esa l{ke gksxsA
Course learning outcome	Student will be able to use the Matrices, Determinants, Geometry and Vector approach in different areas of business and science like Budgeting, Sales projection, cost estimation, alalysing the result of an Experiment etc.

Part-B Content of the course				
	Hkkx& c ikB~;Øe dh fo"k;oLrq			
Unit	Syllabus			
	(English)	(English) Determinants, Basic properties of Determinants, Minor Determinants, Co –factors, Applications of Determinants Finding the Area of a Triangle.		
Unit 1 ¼fganh½		lkjf.kd] lkjf.kd ds vk/kkjHkwr xq.k] mi&lkjf.kd] lg&[k.M] f=Hkqt dk {ks=Qy Kkr djus esa lkjf.kd ds vuqiz;ksxA		
(English)       Matrices, Concept of matrics, Notation Order of Matrices, Types of Matrices, Transport Operations on Matrices- Addition and Multitian Scalar, Simple Properties of Addition, and Scalar Multiplication, Adjoint and Invertimatrix.         Unit 2       ¼fganh½         VkO;wg] vkO;wg dh vo/kkj.kk] vkO;vvadu] Øe vkSj lekurk] vkO;wg ds ize dk ifjorZ] vkO;wg ij lafØ;k] ;ksx vkSj		Matrices, Concept of matrics, Notation Order and Equality of Matrices, Types of Matrices, Transpose of matrix, Operations on Matrices- Addition and Multiplication with a Scalar, Simple Properties of Addition, Multiplication and Scalar Multiplication, Adjoint and Inverse of a Square matrix.		
		vkO;wg] vkO;wg dh vo/kkj.kk] vkO;wg dk vadu] Øe vkSj lekurk] vkO;wg ds izdkj] vkO;wg dk ifjorZ] vkO;wg ij lafØ;k] ;ksx vkSj xq.kk] vfn'k ds lkFk xq.kk] ;ksx] xq.kk vkSj vfn'k xq.ku		

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		ds ljy xq.k/keZ] oxZ eSfVªDI dk lg[k.Mt vkSj	
		izfrykseA	
	(English)	Two Dimensional Coordinate Geometry-Shifting of origion, Slope of a line, Angle between Two lines, Various forms of equations of a line in two dimension, parallel to axes, point slop form, slop intercept form, Two-point form, Intercept form and normal form, General Equation of a line, Distance of a point form a line in two dimension, Three Dimensional coordinate Geometry, Coordinate axes and coordinate planes, coordinates of a point, Distance Between Two Point and section formula	
Unit 3	¼fganh½	f}foeh; funsZ'kkad t;kfefr] ewyfoUnq dk LFkkukUrj.k] js[kk dk <ky] ds<br="" js[kkvksa="" nks="">chp dk dks.k] f}foeh; esa js[kk ds lehdj.kksa ds fofHkUu :i] v{k ds lekukUrj] fcUnq <yku :i]<br=""><yku&var% :i]="" [k.m="" [k.m:i<br="" nks&fcunq="" vur%="">vkSj vfHkyEo :lk] js[kk dk lkekU; lehdj.k] f}foeh; essa ,d js[kk ls ,d fcanq dh nwjh] f}foeh; funsZa'kkad T;kfefr] funsZa'kkad v{k vkSj funsZa'kkad lery] fcanq ds funsZa'kkad] nks fcanqvksa ds e/; dh nwjh vkSj [k.M lw=A</yku&var%></yku></ky]>	
Unit 4	(English)	Vector and Scalars, Magnitude and direction of a vector, Direction cosines and direction ratios of a Vector, Types of vectors and position vector of a point, Negative of a Vector and components of a vector, Operations on vectors – Addition of vectors, Multiplication of a vector by a scalar, Position vector of a point dividing a line segment in a given ratio, Properties and Application of- Scalar (dot) product of vectors, vectors (cross) product of vectors.	
	¼fganh½	Ifn'k vkSj vfn'k] Ifn'k dk ifjek.k vkSj fn'kk] Ifn'k dh fn~d dksT;k vkSj fn~d vuqikr] Ifn'kkas ds izdkj vkSj ,d fcsnq dk fLFkfr Ifn'k]kkRed Ifn'k vkSj ,d Ifn'k ds ?kVdA Ifn'k ij lafØ;k,a] Ifn'kksa	

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vuqiz;ksx] lfn'k dk vfn'k¼MkWV½ xq.kuQy]
lfn'k dk lfn'k¼fr;Zd½ xq.kuQyA

Part-C Learning Resources Hkkx I vuq'kaflr v/;;u lalk/ku

Text books. Reference books, other resourse ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

Suggested Readings: vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh: ikB~;iqLrds%

- 1. P.K. Mittal and Shanti Narayan: Vector Algebra, S.Chand Publishing, 2005.
- 2. Nita H. Shah. Foram A. Thakkar Matrix and Determinant Fundamentals and Applications, CRC Press, 2020.
- 3. G. Prasad; Coordinate Geometry of two and Three Dimensions, Axis

Publications, 2010.

4. e/;izns'k xazFk vdkneh dh iqLrdsaA

#### Reference Books; lanHkZ iqLrdsa ;

- 1- Hari Kishan: A Textbook of Matrices, Atlantic Publishers & Dist.2008.
- 2- Hari Kishan: Vector Algebra and Calculus, Atlantic Publishers & Dist. 2007
- **3-** K.C.Mathew, S.Veeraraghavan: A Textbook of Co-ordinate Geometry of Two and Three Dimensions, Chand Publication.1972.
- 4- Shanti Narayan and P.K.Mittal; A textbook of Matrices, S. Chand Publishing, 1953.

# vuq'kaflr fMftVy lysVQkeZ osc fyad

https;//freevideolectures.com/university/iit-roorkee

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PART-D Assessment and Evaluation				
Suggested Continuous Evaluation Methods:				
Maximum Marks: : 100				
Continuous comprehensive Evaluation(CCE): 30				
Exam : :70	Exam : :70			
Internal Assessment:	Class Test	20		
Continuous comprehensive Assignment /Presentation 10				
Evaluation(CCE) Total Marks =30				

External Assessment: Exam Time: 03.00 Hours	Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)	otal=70
	vuq'kaflr ewY;kdau fof/k;ka aflr Irr~ ewY;kdau fof/k;ka 100 30 70	<u>utai = 70</u>
vkarfjd ewY;kdau Irr~ O;kid ewY;kdau(CCE)	Dykl VsLV vlkabuesaV @ izLrqfrdj.k¼isztsuVs'ku½	20 10 dqy ;ksx= 30
vkdyu% ijh{kk le;% 03.00?kaVs	vuqHkkx¼v½rhu vfr y?kq iz'u¼izR;sd 50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	
		Total= 70

Program: Certificate Course	Class	B.Sc I Year
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Subject	Mathematics	

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Course Type	ikB~;Øe dk izdkj	Elective 2	oSdfYid 2
Title of Pape	er English	Mathematical Logic a	ind Sets
ikB~;Øe dk ˈkh"kZd	fgUnh	xf.krh; rdZ vkSj leqP	p;
Creadit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuks½
Total M	arks : 100	Max Marks: 30+70	Min Marks : 35
		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
		Hkkx& v ifjp;	
iwok	Zis{kk	IHkh ds fy, miyC/k	
Pre-r	equisite	Open for all	
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½ (CLO)		<ol> <li>izR;sd IHkk"k.k es dFku O;Dr djus ds mi;ksx djus esaA</li> <li>rkfdZd O;atdksa o fuekZ.k] rkfdZd rqY fo/ks; Hkk"kk dh H dks O;Dr djus esaA</li> <li>fofHkUu oSpkfjd ;k ds lek/kku esa</li> </ol>	zfØ;k] midj.k vkSj rduhdksa
Course Learning Outcomes		to; 1. Using the Principle	se, the Students will be able es of logic to distinguish nd unsound reasoning in ody.

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		<ul> <li>2. Construct truth tables for logical expressions, test statements for logical equivalence and represent Mathematical statements in the language of predicate language.</li> <li>3. Using the appropriate set theoretic concepts thinking process, tools and techniques in the</li> </ul>
		solution to various conceptual or real-world problems.
	]	Part-B Content of the course
		kkx& c ikB~;Øe dh fo"k;oLrq
Unit	Topics	•
Unit 1	(English)	Mathematical Logic-I-Propositions and truth table, Negation Conjuction and Disjunction, Implications and Double implecation, Bi-conditional Propositions, Contrapositive Imlication and Converse, Contrapositive and Inverse propositions.
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Unit 2	(English)	Mathematical Logic-I-Precedence of Logical Operators, Tautology and Contradiction, Propositional equivalence Logical equivalences, Predicates quantifiers- Introduction, Quantifiers, Binding Variables and Negations.
	l¼fgUnh½	xf.krh; rdZ& II-rkfdZd ladkjdksa dh iwoZrk] iqu:fDr vkSj fojks/k] lk/;kRed rqY;rk% rkfdZd rqY;rk] fo/ks; vkSj izekf=d&ifjp] izekf=d] ck/;dkjh pj vkSj fu"ks/kA
Unit 3	(English)	<b>Set Theory</b> : Introduction to sets, Finite and Infinite sets, Counting Principle, Standard set Operations- Classes of sets, Power set of a set, Difference and Symmetric difference of two sets, Set Identities, Generalized union

	¼fgUnh½	and Intersections, Principle of Inclusion and Exclusion, Cardinality, Fuzzy sets and it's basic operations. IeqPp; fl)kar% leqPp; dk ifjp;] ifjfer vkSj vifjfer leqPp;] x.ku fl)kar] ekud leqPp; IafØ;k& leqPp; ds oxZ] leqPp; dk ?kkr IeqPp;] nks leqPp;ks dk varj vkSj lefer varj] IeqPp; loZlfedk,a] IkekU;hd`r la?k vkSj IoZfu"B] varosZ'ku vkSj viotZu dk fl)kar] x.kuh;rk] vLQqV leqPp; vkSj bldh vk/kkjHkwrlafØ;k,aA
	(English)	<b>Relations</b> - Cartesian product of sets, Composition of relations, Types of relations, Partitions, Equivalence relations, partial ordering relations, Congruence modulo relation.
Unit 4	¼fgUnh½	laca/k& leqPp;ksa dk dkrhZ; xq.kuQy] laca/kks dk la;kstu] laca/kks ds izdkj] foHkktu] rqY;rk laca/k] vkaf'kd Øfer laca/k] le'ks"k ekM~;qyks laca/kA

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Part-C Learning Resources Hkkx I vuq'kaflr v/;;u lalk/ku

Text books. Reference books, other resourse ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

#### Suggested Readings: vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lekxzh:

# ikB~;iqLrds%

- 1. R.M.Somasundaram, Discrete Mathematical Structures PHI Learning Pvt Ltd.2003.
- 2. Samar Ballav Bhoi: A Text book of Logic and sets Educreation Publishing.2018.
- 3. Ganesh: Introduction to Fuzzy Sets and Fuzzy Logic; Prentice Hall India, Learning Pvt. Ltd 2006.
- 4. e/;izns'k xazFk vdkneh dh iqLrdsaA

#### Reference Books; lanHkZ iqLrdsa ;

- **1-** Ajit Kumar. S.Kumaresan, Bhaba kumar Sarma; A Foundation Course in Mathematics. Alpha Science International Ltd. 2018.
- **2-**R.P.Grimaldi. Discrete Marthematics and Combinatorial Mthematics, Pearson Education. 1998.
- **3-** Jean-Paul Tremblay. RManohar: Discrete Mathematics Structures with Applications to Computer Science, McGraw Hill Education 1<sup>st</sup> edition.2017
- 4-G.J. Klir and B.Yuan: Fuzzy set and Fuzzy Logic Pearson.2015

# vuq'kaflr fMftVy lysVQkeZ osc fyad

https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G 7w%3D%3D https;//epathshala.ncert.org.in

PART-D Assessment and Evaluation					
Suggested Continuous Evaluation Methods:Maximum Marks:: 100					
Continuous comprehensive Eval Exam : :70	uation(CCE): 30				
Internal Assessment: Continuous comprehensive Evaluation(CCE) External Assessment: Exam Time: 03.00 Hours	Class Test Assignment /Presentation Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions	Total N	<b>20</b> <b>10</b> Marks =30		
	(500 Words Each)	T	otal=70		
H <u>kkx n vuq'kaflr ewY;kdau fof/k;ka</u> vuq'kaflr Irr~ ewY;kdau fof/k;ka vf/kdre vad: 100 Irr~ O;kid ewY;kdau(CCE): 30 ijh{kk : 70					
vkarfjd ewY;kdau	Dykl VsLV		20		
Irr~ O;kid ewY;kdau(CCE)	vlkabuesaV @ izLrqfrdj.k¼isztsuVs'ku	11/2	10 dqy ;ksx= 25		
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		Total= 70

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#### Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	Donon No. 1
Subject	(हिन्दी)	गणित	– Paper No.: I
Title of	(English)	Abstract Algebra	
the paper	(हिन्दी)	अमूर्त बीजगणित	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus	
(English) Unit I (हिन्दी)	(English)	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties
	(हिन्दी)	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय समूह एवं सामान्य प्रगुण।
Unit II	(English)	Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.
	(हिन्दी)	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय, फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।
Unit III	(English)	Homomorphism and Isomorphism of groups. Fundamental theorem

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		of homomorphism. Transformation and Permutation group. $S_n$ (various subgroups of $S_n$ n < 5 to be studied). Cayley's theorem.	
	(हिन्दी)	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of Automorphism, Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian gropus and non-abelian groups.	
समूह स्वकारिता, अंतः स्वाकारिता, स्वाकारिताओं का स् (हिन्दी) केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित		समूह स्वकारिता, अंतः स्वाकारिता, स्वाकारिताओं का समूह, संयुग्मिता संबंध और केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन–आबेली समूह के लिये कौषी का प्रमेय।	

Unit V	(English)	Definition and basic properties of rings, Ring homomorphism subrings. Ideals and Quotient rings, Polynomial rings & its properties, Integral domain, principal ideal domain. Euclidean domains and unique factorization domains field and quotient fields.	
	(हिन्दी)	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण, पूर्णाकीय प्रांत मुख्य गुणजावली प्रांत, यूक्लिडियन प्रांत एवं अद्वितीय गुणन खंडीकरण प्रांत, क्षेत्र एवं विभाग क्षेत्र।	

#### Text Books

- 1. I.N.Herstein Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977
- 2. PB Bhattacharya, S.K. Jain and S R Nagpaul Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.

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3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

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#### **Reference Books :**

- 1. Shantinarayan A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.
- 2. Surjeet Singh A Text Book of Modern Algebra.
- 3. N. Jacobson Basic Algebra, Vol, I and II, W. II. Freeman.

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4. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House

#### Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	Domor No. 4 H
Subject	(हिन्दी)	गणित	— Paper No.: II
Title of	(English)	Advanced Calculus	
the paper	(हिन्दी)	उच्च कलन	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus	
Unit I	(English)	Definition of a sequence, Theorems on limits of sequences, Indeterminate Forms, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence, Absolute and conditional convergence of series of real and complex term, Rearrangment of series.
	(हिन्दी)	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, अनिर्धाय रूप, परिबद्ध एवं एकदिष्ट अनुक्रम कॉषी का अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉषी का समाकल परीक्षण, कॉषी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण। वास्तविक एवं समिश्र पदों की श्रेणियों का निरपेक्ष एवं प्रतिबंधमयी अभिसरण।
Unit II	(English)	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.
	(हिन्दी)	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलों के लिये डार्बू का मध्यवर्ती मान प्रमेय।
Unit III	(English)	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on

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	homogeneous functions. Taylor's theorem for functions of two variables, Jacobians.
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Unit IV	(English)	Envelops, Evolutes, Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.
	(हिन्दी)	अन्वालोप, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लैग्रांज के गुणांकों की विधि, बीटा एवं गामा फलन।
Unit V	(English)	Double and triple integrals, volumes and surfaces of solids of revolution, Dirichlet's integrals, change of order of integration in double integrals.
	(हिन्दी)	द्विक एवं त्रि—समाकल, ठोस के परिभ्रमण से जनित आयतन एवं पृष्ठ, ड्रीचलेंटस् समाकल द्विक समाकल के क्रम का परिवर्तन।

#### Text Books

- 1. R.R. Goldbeg Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi
- 2. Gorakh Prasad Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad
- 3. Gorakh Prasad Integral Calculus, Pothishala Pvt. Ltd. Allahabad

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4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### Reference Books :

- 1. Gabriel Klaumber Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975
- 2. T.M. Apostol Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985
- 3. D. Soma Sundaram and B. Choudhary A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.

- 4. Murray R. Spiegel Theory and problems of advance Calculus, Schaum Publishing Co, New York.
- 5. O.E. Stanaitis An introduction to Sequences, Series and improper integrals.

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#### Theory

Class		B.Sc. / B.A. II Year	
C	(English)	Mathematics	Domor No. 4 III
Subject	(हिन्दी)	गणित	– Paper No.: III
Title of	(English)	Differential Equations	
the paper	he paper (हिन्दी) अवकल समीकरण		
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus	
Unit I	(English)	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.
	(हिन्दी)	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।
Unit II	(English)	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.
	(हिन्दी)	लॉप्लास रूपांतरण, लॉप्लास रूपांतरण की रैखिकता, लॉप्लास रूपांतरण के लिये अस्तित्व प्रमेय। अवकलजों एवं समाकलों का लॉप्लाज रूपांतरण, स्थानांतर प्रमेय, रूपांतरणों का अवकलन एवं समाकलन।
Unit III	(English)	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving, Initial value problems of second order linear differential equations with constant coefficients.
	(हिन्दी)	izfrykse ykWlykl :ikarj.k] laoyu izes;] izkjafHkd eku leL;kvksa ds fy, f}rh; dksfV ds vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa ykWlykl :ikarj.kksa ds vuqiz;ksxA

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Unit IV	(English)	Partial differential equations of the first order, Lagrarange's solutions, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method.	
	(हिन्दी)	प्रथम कोटि के आंषिक अवकल समीकरण, लैग्रांज विधि, विषिष्ट प्रकार के अवकल समीकरण का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरला से हल, चारपिट की व्यापक विधि।	
Unit V	(English)	Partial differential equations of second and higher orders.Classification of partial differential equations of second order.Homogeneous and non-homogeneous equations with constantcoefficient. Partial differential equations reducible to equations withconstant co-efficients, equation of vibrating string, Heat equation,Laplace equation and their solutions.	
	(हिन्दी)	द्वितीय व उच्च कोटि के आंषिक अवकल समीकरण, द्वितीय कोटि के आंषिक अवकल समीकरणों का वर्गीकरण अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों में समानेय आंषिक अवकल समीकरण, कम्पनेय डोरी का समीकरण, ऊष्मा समीकरण, लाप्लास समीकरण एवं इनके हल।	

#### Text Books

- 1. Sharma and Gupta Integral Transform, Pragati , Prakashan Meerut.
- 2. Sharma and Gupta Differential Equation, Pragati , Prakashan Meerut.
- 3. Raysinghania Differential Equaitons, S. Chand & Company, New Delhi
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books** :

1. D.A. Murray – Introductory course in differential equation, Orient Longman, India, 1967.

2. G.F. Simnons – Differential Equations, Tata Mcgraw Hill, 1972.

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- 3. E.A. Codington An introduction to Ordinary differential equations. Prentice Hall of India,1961
- 4. H.T.H. Piaggio Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.

5. E.D. Rainville – Special Functions, The Macmillan Company, New York.

Class		B.Sc. / B.A. III Year	
C	(English)	Mathematics	Domon No. 4 I
Subject	(हिन्दी)	गणित	– Paper No.: I
Title of	Citle of(English)Linear Algebra and Numerical Analysis		
the paper	(हिन्दी)	रैखिक बीजगणित एवं संख्यात्मक विष्लेषण	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus	
Unit I	(English)	Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.
	(हिन्दी)	सदिष समष्टि की परिभाषा एवं उदाहरण उपसमष्टि उपसमष्टियां का योग एवं प्रत्यक्ष योग, रैखिक विस्तृति, रैखिक परतंत्रता, स्वतंत्रता एवं उनके मूल गुणधर्म आधार, आधार का अस्तित्व प्रमेय, विस्तार प्रमेय आधार में अवयवों की संख्या की

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		अपरिवर्तनषील विमीय परिमित विमीय सदिष समष्टि का उपसमष्टि की पुरक उपसमष्टि का अस्तित्व उपसमष्टियों के योग की विमा, विभाग समष्टि एवं उसकी विमा।
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear-Quadratic and Hermitian forms.
	(हिन्दी)	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों की बीज गणित जाति शून्यता प्रमेय, आधार का परिवर्तन द्वैत समष्टि, द्विद्वैत समष्टि एवं प्राकृतिक तुल्याकारिता, एडज्वाइन्ट का रैखिक रूपांतरण, रैखिक रूपांतरणों के आइगन मान एवं आइगन सदिष, विकर्णीकरण, द्विएकघात, द्विघाती एवं हर्मितीय समघात।

Unit III	(English)	Inner Product Spaces – Cauchy-Schwartz inequality, orthogonalvectors, orthogonal complements, orthonormal sets and bases,Bessel's inequality for finite dimensional spaces, Gram-Schmidiorthogonalization process.
	(हिन्दी)	vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd lfn'k] ykafcr iwjd] izlkekU; ykafcd leqPp; ,oa vk/kkj] ifjfer foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV ykafcdrk izØeA
Unit IV	(English)	Solution of Equations : Bisection, Secant, Regula Falsi, Newton'sMethods Roots of second degree Polynomial equations.Interpolation : Lagrange interpolation, Divided differences,Interpolation formula using Differences, Numerical Quadrature,Newtorn – Cote's formulae, Gauss Quadrature formulae.
	(हिन्दी)	समीकरणों के हल – द्वि–विभाजन विधि, सिकेन्ट विधि, रेग्यूला फाल्सी विधि,

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		न्यूटन विधि, द्वितीय घात के बहुपद समीकरण के मूल। अर्न्तवेषन — लैग्रांज अर्न्तवेषन, विभाजित अंतर, अंतर के उपयोग से अर्न्तवेषन सूत्र संख्यात्मक
		अन्तपंषेन, विमाजित अंतर, अंतर के उपयोग से अन्तपंषेन सूत्र संख्यात्मक क्षेत्रकलन न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र।
Unit V	(English)	Linear equations direct methods for solving systems of linear equations (Gauss elimination, L.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single step method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration, methods based on numerical differentiation.
	(हिन्दी)	रैखिक समीकरण, रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियाः (गाउस विलोपन, एल–यू वियोजन, चोलेस्की वियोजन) पुनरावृत्ती विधियाँ (जकाबी विधि, गाउस सिडेल विधि), साधारण अवकल समीकरण आयलर विधि, एकल चरण विधि, रूंग कुट्टा विधि, बहुचरण विधि, मिलने–सिम्पसन विधि, संख्यात्मक समाकलन पर आधारित विधियाँ एवं संख्यात्मक अवकलन पर आधारित विधियाँ।

#### Text Books

1. K.B. Datta – Matrix and Linear Algebra, Prentice hall of India Pvt. Ltd, New Delhi, 2000. 2. S.S. Sastry – Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

#### Reference Books :

- 1. K. Hoffman and R. Kunze Linear Algebra, 2<sup>nd</sup> Edition, Prentice Hall Englewood Cliffs New Jersey, 1971.
- 2. S.K. Jain. A Gunawardena & P.B. Bhattacharya Basic Linear Algebra with MATLAB Key College Publishing (Springer - Verlag) 2001.
- 3. S, Kumarsaran Linear Alebra, A Bermetric Approach Prentice Hall of India, 2000.
- 4. Balaguruswamy Numerical methods, Tata Mc Graw Hill Publications, New York.

#### Theory

Class		B.Sc. / B.A. III Year				
Subject	(English)	Mathematics	Damar No. 4 H			
Subject (हिन्दी)		गणित	Paper No.: II			
Title of	(English)	Real and Complex Analysis				
the paper	(हिन्दी)	वास्तविक एवं सम्मिश्र विष्लेषण				
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English				
Maximum	Marks	Total : 50				

Unit	Syllabus	
Unit I	(English)	Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables, Schwartz's and Young's theorem, Implicit function theorem.
	(हिन्दी)	रीमान समाकल, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान प्रमेय, दो चरों के वास्तविक मान फलनों के आंषिक अवकलज एवं अवकलनीयता, स्वार्ज एवं यंग के प्रमेय, अस्पष्ट फलन प्रमेय।
Unit II	(English)	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullan's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.
	(हिन्दी)	अनुचित समाकल एवं उनका अभिसरण तुलना परीक्षण आबेल एवं डिरिक्ले का परीक्षण, प्रचालिक फलनों के रूप में फ्रुलानी समाकल, सांतत्य, एक प्राचल के फलन के समाकल अवकलनीयता एवं समाकलनीयता, अर्द्ध एवं पूर्ण अंतरालों की फोरियर श्रेणी।

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	(English)	Definition and examples of metric spaces, Neighbourhoods, Limit points, interior points, Open and closed sets. Closure and interior, Boundary points, Subspace of metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real number as a complete ordered field. Dense subsets Baire Category theorem, Separable, second countable and first countable spaces, Continuous functions, Uniform continuity, Properties of Continuous functions on Compact sets.
Unit III	(हिन्दी)	nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehl;] lhek fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod la[;k;sa] la?ku mileqPp; ck;j&dsVsxjh izes;] i`FkDdj.k] f}rh; x.kuh; ,oa izFke x.kuh; lef"V] सतत फलन, एकसमान सांतत्य, संहत समुच्चयksa ij Irr~ Qyuksa ds izxq.kA
	(English)	Continuity and differentiability of compex function. Analytic functions, Cauchy-Reimann equations. Harmonic functions, Cauchy's Theorem, Cauchy's Integral Formula
Unit IV	(हिन्दी)	सम्मिश्र फलनों की सातत्यता और अवकलनीयता, विष्लैषिक फलन, कौषी–रीमान समीकरण, हारमोनिक फलन, कौषी प्रमेय एवं कौषी समाकलन सूत्र।

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Unit V	(English)	Power Series representation of an analytical function, Taylor's series, Laurant's series, Singularities, Cauchy's Residue Theorem, Contour Integration.
	(हिन्दी)	घात श्रेणी, वैष्लेषिक कलन का निरूपण, टेलर की श्रेणी, लॉरेन्ट की श्रेणी, विलक्षणता (सिंगुलेरटीज) कॉषी का अवषेष प्रमेय, परिरेखा (कंटूर) समाकलन।

#### Text Books

- 1. Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi
- 2. G.J. Simmons Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963
- 3. L.V. Alhfors, complex analysis Mc Graw Hill, New York
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books :**

- 1. Water Rudin Real and Complex Analysis Mc Graw Hill, New York.
- 2. Ponnusway Complex Analysis, Narosa Publication, New Delhi.

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3. R.V. Churchill & J.W. Brown, Complex Variables and Application, 5<sup>th</sup> Edition, Mc Graw Hill, New York, 1990.

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#### Theory

Class		B.Sc. / B.A. III Year			
Subject	(English)	Mathematics		Domon No A III	
Subject	(हिन्दी)	गणित	Paper No.:		
Title of	(English)	Discrete Mathematics			
the paper	(हिन्दी)	विविक्त गणित			
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, Englis	sh		
Maximum Marks		Total: 50			

Unit	Syllabus					
	(English)	Boolean functions – disjunctive & conjunctive normal forms (canonical & dual canonical), Bools's expansion theorem. Relations – Binary relation, Inverse relation, Composite relation, Equivalence relation, Equivalence classes & its properties Partition of a set.				
Unit I	(हिन्दी)	बूलीय फलन – वियोजनीय एवं संयोजनीय प्रसामान्य रूप (केनोनिकल एवं डूअल केनानिकल), बूल का विस्तार प्रमेय। संबंध – द्विचर संबंध, प्रतिलोम संबंध, संयोजित संबंध, तुल्यता संबंध, तुल्यता वर्ग एवं उसके गुण धर्म, समुच्चय का विभाजन।				
Unit II	(English) Partial order relation, Partially ordered sets, totally ordered (English) Partial order relation, Partially ordered sets, totally ordered Hasse diagram, maximal and minimal element first element. Lattice – definition and examples, dual lattice, lattice, distributive lattice, complemented lattice.					
	(हिन्दी)	अंषतः क्रम संबंध, अंषतः क्रमित समुच्चय, पूर्णत क्रमित समुच्चय, हैसूह आरेख, उच्चिष्ठ एवं निम्निष्ठ अवयव, प्रथम एवं अन्तिम अवयव, जालक — परिभाषा एवं उदाहरण, द्वैत जालक, परिबद्ध जालक, वितरणीय जालक, पूरक जालक।				
Unit III	(English)	Graph – Definition types of graphs, Subgraphs, walk-path, circuit, connected and disconnected graphs. Euler graph. Hamiltonian path and circuit, shortest path in weighted graph. Dijkstra's Algorithm for shortest paths.				
	(हिन्दी)	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k] xeu] iFk ,oa				

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Unit IV	(English)	Trees and its properties, Rooted tree, Binary tree, Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.
	(हिन्दी)	वृक्ष एवं उसके गुण धर्म, नियत वृक्ष, द्विवचर वृक्ष, जनक वृक्ष, आलेख की जाति एवं शून्यता, कुस्कल एवं प्राइम की एल्गोरिथम।
Unit V	(English)	Matrix representation of graph – Incidence and Adjacency matrix. Cutset and its properties. Planar graphs (definition) Kuratowski's two graphs.
	(हिन्दी)	आलेख का आव्यूह निरूपण – इन्सीडेंस एवं एडजेन्सी आव्यूह , कटसेट्स एवं उसके प्रगुण, प्लानर आलेख (परिभाषा), कुराटोव्हस्की के द्विआलेख।

#### Text Books

1. C.L.Liu – Elements of Discrete Mathematics, Mcgraw Hill, New-York

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- 2. Narsingh Deo Graph Theroy, Prentice Hall
- 3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।



# **M.Sc. SEMESTER I**

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Signature of Mamber of B.O.S.

#### Theory

Class		M.Se	c / M.A.		Semester: I	
S	Subject		Mathematics			
Title o	Title of the paper		stract Algebra-I	Paper	No: I (Comj	pulsory)
Medium of instructions (Teaching)		English		Question Paper Language: English		
Maxim	um Marks	Total 100	Main Exam:	70	C.C.E:	30
Unit I	Normal & Sub	onormal series of g	groups, Compositio	on series,	Jordan-Holde	r series.
Unit II	Solvable & Nil	potent groups.				
Unit III			nomials, Algebraic nseparable extensi		nscendental ex	tensions.
Unit IV	Perfect fields,	Finite fields, Alge	braically closed fie	lds.		
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.					
Recommend Book	2. P.B.	· •	n Algebra, Wiley I K. Jain and S.R. N	, i i i i i i i i i i i i i i i i i i i		Algebra,

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.		Semester: I		
Subject		Matl	hematics			
Title of the pape	er	Real	Analysis	Paper 1	No: II (Com	pulsory)
Medium of instructions (Teaching)		E	nglish	Quest	Question Paper Language: English	
Maximum Mar	ks	<b>Total: 100</b>	Main Exam:	70	C.C.E:	30
Unit I			tistence of Riema tion and differentia		tjes integral	and its
Unit II		0	vector-valued fu terms of a series. F	nctions, Riemann'	Rectifiable s theorem.	curves.
Unit III	conv M-t and	vergence, Caucl est, uniform co	eries of function by criterion for uni onvergence and co eltjes integration,	form con ntinuity,	vergence, Wo uniform con	eierstrass wergence
Unit IV	an o		ll variables, linear R <sup>n</sup> Chain rule, par n theorem.			
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,					
Recommended Books1. Walter Rudin, Principles of Mathematical Analysis, M Hill.				McGraw		
Reference1. T.M. Apostal, Mathematical Analysis Narosa.2. H.L. Royden , Real Analysis, Macmillan (Indian Editi					ion)	

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.			Semester:	I
Subject		Mathematics				
Title o	Title of the paper		ology-I	Paper	No : III (Com	pulsory)
Medium	of instructions	Eı	nglish	Quest	ion Paper Lar	iguage:
(Te	aching)				English	
Maxim	num Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.					Cantor's
Unit II	Neighborhoods,	interior exterio	logical spaces. Clos r and boundary. A paces and relative to	ccumula		
Unit III			g a topology in stems. Continuous			
Unit IV	First and Second Countability and	-	ces. Lindeiof's the	orems. Se	parable space	s. Second
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.					
Recommend Books	2. G.F. McG	Munkres, Topology- A first course. Prentice-hall of India. . Simmons, Introduction to Topology and Modern Analysis, Graw Hill. . Joshi, Introduction to general topology, Wiley Eastern.				

Note : Setting is to be Done Strictly From Recommended Books.

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Class		M.Sc / M.A.		Semest	er: I	
Subject		Mathematics				
Title of the	paper	Complex Ana	lysis-I	Paper I	No : IV (Co	mpulsory)
Medium of instructions (Teaching)		English		Questic English	on Paper La	nguage:
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Complex integ order derivativ	•	Goursat theorem.	Cauchy in	itegral form	ula, Higher
Unit II		orem. Cauchy's ebra. Taylor's th	inequality. Liouv neorem.	ville's theo	rem. The f	undamental
Unit III	singularities.		nciple. Schwartz function theorem rem.			
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.					
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.					nitions and
Recommer Books		Conway, Functio	ons of one complex	k variable,	Springer-ve	rlag.

Theory

Note : Setting is to be Done Strictly From Recommended Books

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Theory

Class		M.Sc / M.A.		Semeste	er: I		
Subject		Mathematics					
Title of the paper		Advanced Dise Mathematics-		Paper N	No: V(l) (o	ptional)	
Medium of (Teaching)	f instructions	English		Questio English	n Paper La	anguage:	
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	groups and me	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of sen groups and monoids. Congruence relation and Quotient Semi groups. Dire products. Basic Homomorphism Theorem.					
Unit II			rdered sets, their p ed lattices, Distrib	-	-	0	
Unit III	irreducible eler forms, minimiz	ments, minterm ation of Boolea	ebras as lattices, v s, maxterms, mint an functions. Appli DR, & NOT gates) t	erm Boo cations o	lean form of Boolean	s, canonical Algebra to	
Unit IV	graphs. Euler g	graphs, weighted	d types of graphs l graphs (undirecte inary trees, spannir	d) Dijkst	ra's Algori	ithm. Trees,	
Unit VComplete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut & circuits, Connectivity and Separability, Planar graphs, Kuratowski's graphs, Euler's formula for planar graph							
Recommen Books	McG	Tremblay & R. Manobar, Discrete mathematical Structur Fraw Hill. eo, Graph Theory with applications, Preritice-Hill.				Structures,	

Note : Setting is to be Done Strictly From Recommended Books.

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# **M.Sc. SEMESTER II**

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Class		M.Sc / M.A.		Semeste	er: II	
Subject		Mathematics	Mathematics			
Title of the	paper	Advanced Abs	stract Algebra-II	Paper N	No : I	
Medium of i (Teaching)	instructions	English		Questio English	on Paper La	nguage:
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Introduction to modules, Examples, sub modules quotient modules modul Homomorphism, isomorphism. Finitely generated modules, cyclic modules.					
Unit II	Simple module	s, Semisimple m	odules, Free modu	les, Schur <sup>y</sup>	's lemma.	
Unit III	Noetherain & Artin theorem.	Artinian module	es and rings, Hilbo	ert basis t	heorem. Wo	edderburn-
Unit IV		, <b>.</b>	modules, Noether ver a principal ide			ındamental
Unit V	Algebra of linear transformation, Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.					
Recommend Books	ecommended ooks1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstr Cambridge. University Press, (Indian Edition)2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi					ct Algebra,

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Theory

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / N	Л.А.		Semest	Semester: II		
Subject			Mathem	natics					
Title of the paper		Lebesqu Integrat		sure &	Paper I	No : II			
Medium of instructions (Teaching)		tions	English			Questic English	on Paper La	nguage:	
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30	
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions Borel and Lebesgue measurability. Non-measurable sets.					functions.			
Unit II	0	ration of N ann and L			ictions. The Gener ls.	al integra	l. Integratio	on of Series,	
Unit III		Four deriv rem, Differ			ns of Bounded van Itegration.	riation. Lo	ebesgue Dif	ferentiation	
Unit IV		L <sup>p</sup> -spaces, alities. Co			ons, jensen's inec	quality. H	older and	Minkowski	
Unit V	Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence a almost uniform convergence.					ergence and			
Recommend Books	1. G.D.Barra Measure theory and integration.								

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

lass		M.Sc / M.A.		Semest	er: II			
Subject		Mathematics						
Title of the	Title of the paper			Paper I	No : III			
	Medium of instructions (Teaching)			Questio	on Paper La English	nguage:		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30		
Unit I	-	Separation axioms T <sub>0</sub> ,T <sub>1</sub> ,T <sub>2</sub> ,T <sub>3</sub> ,T <sub>4</sub> : their Characterizations and basic proper Urysohn's lemma. Tietze extension theorem.						
Unit II	compactness. (	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.						
Unit III	characterization Connectedness	ns. Projection	v in terms of maps. Separation aces. Compactness uct space.	axioms	and prod	uct spaces.		
Unit IV	Compactness an	nd nets. Filters a	d convergence of and their convergen tra-filters and comp	ce. Cano				
Unit V	The fundamental group and covering spaces-Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra.							
Recomme Books	nded Pvt. 2. G.F McC	nes R. Munkres Topology, A First Course. Prentice Hall of In Ltd. New Delhi. Simmons, Introduction to Topology and Modern Analy Graw-Hill Book Company. J.Joshi, Introduction to General Topology,Wiley Eastern.				n Analysis,		

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / M.A.		Semest	er: I	I	
Subject			Mathematics					
Title of the paper			Complex Anal	ysis-II	Paper 1	No : IV		
Medium of (Teaching)	instruc	tions	English		Questie English	on Paper La 1	inguage:	
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30	
Unit I		Weierstrass factorization theorem. Gamma and its properties. Riemann Ze function. Riemann's functional equation						
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.						v	
Unit III			tion principle. I llet problem. Gr	Harmonic function reen's function.	n on disc. I	Harnack ine	equality and	
Unit IV	of an	-	inction. Expone	formula. Hadama ant of convergend				
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem Schottky's theorem. Montel Caratheodary and great Picard theorem. Univale function. Bieberbach conjecture and the <sup>1</sup> / <sub>4</sub> –theorem.							
Recommen Books	iended 1. J.B. Conway, Functions of one complex variable, Springer-Verlag. 2. H.K.Pathak, complex variable					Verlag.		

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class			M.Sc / M.A.		Semeste	er: I	I	
Subject			Mathematics					
Title of the paper		Advanced Disc Mathematics-J			Paper No : V(l) (optional)			
Medium of (Teaching)		ions	English		Questio English	on Paper La	inguage:	
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	circui	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.						
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions , generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.						ations with	
Unit III	deriva	ation, sent		guages , Languag anguage generated rammars.				
Unit IV	state	Acceptors	deterministic a,	m & Languages d and Non-determin Fable & Diagrams.	istic Finit	e Automata	finite State	
Unit V	Reduced machines , Kleen's Theorem (statement only )Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.( definition only )							
Recommended McGraw Books			Tremblay & R. Manobar, Discrete mathematical Structures v Hill. o, Graph Theory with applications, Preritice-Hill				Structures,	
Note : Sett	ing is to l			commended Books				



# **M.Sc. SEMESTER III**

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Signature of Mamber of B.O.S.

Class		M.Sc / M.A.		Semeste	er: III			
Subject		Mathematics						
Title of the	paper	Functional An	alysis-I	Paper N	No : I			
Medium of (Teaching)	instructions	English		Questio English	n Paper La	inguage:		
Maximum N	Marks	Total: 100	Main Exam:	70	C.C.E:	30		
Unit I		Normed Linear spaces, Banach Spaces and examples. Properties of normed 1 spaces Basic Properties of finite dimensional normed linear spaces.						
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compacting quotient space of normed linear spaces and its completeness.							
Unit III	Linear operator	r, Bounded linea	r operator and con	tinuous o	perators.			
Unit IV	Linear function	al, bounded line	ear functional, Dual	spaces w	ith example	es.		
Unit V		orthogonal co of functional on	omplements, ortho Hilbert spaces.	onormal	sets and	sequences.		
Recommend Books	ded Wiley 2. G.I	v & sons, New Yo	roductions to Topo	-				
Reference	nce 1. B.Choudhary and Sudarshan Nanda, Functional Analysis applications Wiley Eastern Ltd.							

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#### Theory

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / N	M.A.		Semeste	er:	III
Subject			Mathen	Mathematics				
Title of the j	paper		Integra	l Trans	sform-I	Paper N	No : II	
Medium of instructions (Teaching)		English			Questio English	-	er Language:	
Maximum N	Marks Total: 100 Main Ex				Main Exam:	70	C.C.I	E: 30
Unit I		Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.						of derivatives,
Unit II		cation to l nulates diff		-	ations, Application	to Integ	ral equ	uations. Solution
Unit III	-	ice Equatio ve equatio		dimen	sion, Wave Equation	on in one	dimen	sion Application
Unit IV	Appli	cation of I	Laplace T	<b>`ransfo</b>	rm to electrical circ	cuits, App	olicatio	on to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.							
Recommend Books		tegral Transforms by Goyal and Gupta. tegral Transform by Sneddon.						

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

lass			M.Sc / M.A.		Semeste	er: III	
Subject			Mathematics				
Title of the	paper		Advanced Gra	ph Theory-I	Paper N	lo : III	
Medium of instructions (Teaching)		English		Questio	n Paper La English	nguage:	
Maximum Marks			Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Revisio	n of gra	ph theoretic pre	liminaries. Isomo	orphism of g	raphs, subg	raphs.
Unit II	compo	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.					
Unit III	-	-	· · · · ·	nce and centers i ircuits, spanning	,		
Unit IV		s, Prope parability		et, Fundamental	circuits and	d cut-sets, c	connectivity
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.						
Recommended Books by N				applications to E rentice Hall of Ind rary.	0 0	and Compu	iter Science

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Note : Setting is to be Done Strictly From Recommended Books.

Class			M.Sc / M.A.		Semeste	er: III	
Subject			Mathematics				
Title of the <b>j</b>	paper		Operations Re	esearch-I	Paper N	lo : IV	
Medium of instructions (Teaching)		English		Questio English	n Paper La	nguage:	
Maximum MarksTotal: 100Main Exam:70C.C			C.C.E:	30			
Unit I		Operations Research and its scope, Origin and Development of Operation Research, Characteristics of Operations Research.					Operations
Unit II		-		ch, Phase of Op rch, Linear Progran			Uses and
Unit III	Math	ematical F	ormulation, Gra	phical Solution Me	thod.		
Unit IV	artifi	General Linear Programming Problem: Simplex Method exceptional cases artificial variable techniques; Big M method, two phase Method and Cycli Problems, problem of degeneracy.					
Unit V	Duality, Fundamental properties of duality and theorem of duality.						
Dook			i Swarup, PO.K. Gupta and Manmohan, Operations Research, an Chand & Sons., New Delhi.				

Theory

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class			M.Sc / M.A.		Semest	er: III	
Subject			Mathematics				
Title of the paper			Theory of Lin	ear Operators-I	Paper N (option	No: V(l) al)	
Medium of instructions (Teaching)			English		Questio English	on Paper La	nguage:
Maximum N	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	-	ral Theory pectrum.	y in finite dime	nsional normed spa	ces. Regi	ılar value r	esolvent set
Unit II	-	ral Proper em for pol		l Linear Operators	resolvent	t and spectr	al mapping
Unit III	-			inear operator on a Banach Algebras.	complex	banach spa	ace. Banach
Unit IV	Com opera		operators on n	ormed spaces, furth	ner prope	erties of con	npact linear
Unit V	Spect	ral proper	ties of compact	linear operators.			
Recommend	led		eyszing, Introd Sons, New Yorl	uctory functional a x 1978.	nalysis v	vith applica	tions. Jhon
Books			Simmons, Intr Hill, New York	oduction to Topole	ogy & N	Modern An	alysis Tata
<u> </u>				tuion to Hilbert sp tion, Chelsea Publis			
Neierence			Dund Ford and J.T. Schwartz. Linear operator-3 part inter Wile New Youk, 1958-74				
		3. G. Bac York 196	achman and L. Narcil, Functional analysis for academic press New 966.				e press New
Note · Settir	ng is to	he Done St	trictly From Ro	commended Books.			

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Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S. .....



## **M.Sc. SEMESTER IV**

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Class		M.Sc / M.A.		Semeste	er: IV		
Subject		Mathematics	Mathematics				
Title of the	paper	Functional An	alysis-II	Paper N	No : I		
Medium of (Teaching)	instructions	English		Questio English	n Paper Language:		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E: 30		
Unit I	•	Hilbert adjoint operator and its properties, self adjoint, Unitary and norm operators positive operator.					
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.						
Unit III	•		l spaces, relation xive spaces, Reflexiv		adjoint operator and lbert space.		
Unit IV			egory theorem, uni and weak convergen		indedness theorem and med spaces.		
Unit V	_	of sequences of o theorem, contract	-	ionals, oj	pen mapping theorem,		
Recommen Books	ded Wil 2.	ley & Sons, New Y	eyszig, Introductory Functional Analysis with applications, John & Sons, New York 1978. . Simmons, Introduction to Topology & Modern Analysis w Hill, New York.				
ReferenceB. Choudhary and Sudarshan Nanda, Functional Analysi applications, Wiley Eastern Ltd.					ctional Analysis with		

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#### Theory

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class	Class		M.Sc / I	M.A.		Semest	Semester: IV		
Subject	Subject		Mathematics						
Title of the	e paper		Integral Transform-II		Paper I	Paper No : II			
Medium of instructions (Teaching)		English			Question Paper Languages English		nguage:		
Maximum	Marks		Total:	100	Main Exam:	70	C.C.E:	30	
Unit I	Fouri	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.					form.		
Unit II	Finite	Fourier 1	<b>Fransform</b>	n and I	Fourier Integral.				
Unit III		olution the er transfo	-	erseval'	s Identity for Fou	ırier series	, Parseval's	Identity for	
Unit IV	Appli	Application for Fourier Transform to Boundary value problems.							
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems								
Recommended Books 2. Int		egral Tra	nsform	is by Goyal and G is by I.N. Sneddor is by Gupta and V	n.				

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

lass			M.Sc / M.A.		Semest	ter: IV	
Subject	Subject		Mathematics				
Title of the	paper		Advanced Gra	ph Theory-II	Paper	No : III	
Medium of instructions (Teaching)		English			Question Paper Language: English		
Maximum 1	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circu Matrix, Fundamental circuit matrix and Rank of B, An application to a switchin Network.						
Unit II	Cut-set matrix		, Relationships	among Af, Bf	and Cf, p	ath matrix,	Adjacency
Unit III	Chrom matchi		nber, chromati	c Partitioning, c	hromatic	Polynomial,	Coverings,
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.					graphs and	
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.					n Digraphs.	
Recommended Books by N			ph theory with Narsingh Deo. ph theory by Ha	applications to E rary.	ngineerin	g and comp	uter science

Note : Setting is to be Done Strictly From Recommended Books.

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Class			M.Sc / M.A.	Semester: IV			
Subject			Mathematics				
Title of the paper		Operations Re	search-II	Paper N	lo : IV		
Medium of instructions (Teaching)		English		-	Question Paper Language: English		
Maximum N	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Voge	-	-	Dorth-West Corner I, MODI Method. E			
Unit II		Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.					ıhn-Tucker
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)						
Unit IV		lation: Mo ation of Si		ulation. Simulation	of Netv	vorks, Adva	antage and
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.					<b>-</b> - /	
Recommended Books1. Kanti Swarup, P.K. Gupta Sultan Chand & Sons, New D					ımohan,	Operations	Research,
Reference 2. F.S. (Thi			s book comes wi	tions Research. . Lieberman, Indus ith a CD containing gramming, Narosa	Software	e)	

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Theory

4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading
mass.
5. H.A. Taha, Operations Research,- An Introduction Macmillan
Publishing.
6. Prem Kumar Gupta and D.S. Hira, Operations Research, an
Introduction S.Chand & Company Ltd., New Delhi.
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-
West Pvt, New Delhi, Madras.

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class			M.Sc / M.A.		Semeste	er: IV	
Subject			Mathematics				
Title of the paper		Theory of Linear Operators-II		Paper No : V(l) (optional)			
Medium of instructions (Teaching)			English Question Paper Lan English			- 00	
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E: 30	
Unit I		-	al properties o act linear operat	-	operator	s, Operator Equation	
Unit II		ther theorems of Fredholm type, Bi-orthonormal system, Fredholm ernative, Equicontinuous sequence, compact integral operator.					
Unit III	-	ral properties of Bounded Self-Adjoint linear operators, Further Properties unded Self-Adjoint linear operators.					
Unit IV		-	-	oositive operators, r oots of positive oper		sequences of bounded	
Unit V	•	Projection Operators: Product and sum of projections. Further properties of projections.					
Recommended Wiley &			eyszing, Introductory Functional Analysis with Application, John z Sons, New York, 1978. Simmons, Introduction to Topology & Modern Analysis McGraw w York.				
Reference Multiplic		ity, Second Edit	ion, Chelsea Publis	hing co. Y	the theory of Spectral X.Y., 1957. operator-3 part inter		
Noto : Sott	ing is to	science/V	Viley, New York			perator-5 part inter	

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Note : Setting is to be Done Strictly From Recommended Books.

#### **Course:**

## B.Sc. (Scheme Of Examination)

Theory Papers	Title of paper		Marks		Compulsory/Optional
		Theory	C.C.E	Total	
		B.SC.I-YE	AR		
Paper I	Algebra , Vector Analysis &Geometry	70	30	100	Major
Paper II	Calculus & Differential Equations	70	30	100	Major /Minor /Elective
	B	B.SC. II YE	EAR		
Paper 1	Abstract Algebra	50			
Paper II	Advanced Calculus	50		200	
Paper III	Differential Equations	50	50		
	B	.SC. III YI	EAR		
Paper I	Linear Algebra & Numerical Analysis	50			Compulsory
Paper II	Real And Complex Analysis	50	50	200	Compulsory
Paper III	Discrete Mathematics	50		<u> </u>	Optional

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#### Scheme of examination

#### **Course:**

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#### M.Sc. (2 Years Degree Course)

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Theory	Title of paper	Compulsory/Opt		Mark	(S			
Papers		ional	Theor	<b>C.C</b>	Total			
			У	.E				
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100			
Paper II	Real Analysis	Compulsory	70	30	100			
Paper III	Topology-I	Compulsory	70	30	100			
Paper IV	Complex Analysis-I	Compulsory	70	30	100			
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100			
Paper VI	Job Oriented Project Work	Compulsory			50			

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		SEMESTER II				
Paper I	Advanced Abstract Algebra- II	Compulsory	70	30	100	
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100	
Paper III	Topology-II	Compulsory	70	30	100	
Paper IV	Complex Analysis-II	Compulsory	70	30	100	
Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100	
Paper VI	Job Oriented Project Work	Compulsory			50	
SEMESTER III						
Paper I	Functional Analysis - I	Compulsory	70	30	100	
Paper II	Integral Transforms - I	Optional	70	30	100	
Paper III	Advanced Graph Theory -I	Optional	70	30	100	
Paper IV	Operations Research-I	Optional	70	30	100	
Paper V	Theory of Linear Operators-I	Optional	70	30	100	
Paper VI	Job Oriented Project Work	Compulsory			50	
		SEMESTER IV				
Paper I	Functional Analysis - II	Compulsory	70	30	100	
Paper II	Integral Transforms - II	Optional	70	30	100	

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Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory			50
Paper VII	Internship	Compulsory			100

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# **Syllabus**

# 2021 -2022

# Semester / yearly Pattern Subject: MATHEMATICS

Page No.

CON	NTENTS	
Under Graduate Level		
	Theory Paper	B.Sc.I Year
	,, ,,	B.Sc.II Year
	,, ,,	B.Sc.III Year
Post Graduate Level		
	Theory Paper	Semester I
	,, ,,	Semester II
	,, ,,	Semester III
	,, ,,	Semester IV

Date of submission in Autonomous Examination cell:

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Signature H.O.D.

# Course outcomes (COS) Class : B.Sc. II Year Paper : I

### Title : Abstract Algebra Mathematics

The objective of this course is to help all the students to develop a positive attitude towards.

- 1. Group theory and applications of Group, Subgroups, Cyclic groups and its properties.
- 2. Have a deeper understanding of Lagrange's theorem Fermal's theorem. Normal subgroups and Quotient groups.
- 3. Have a solid knowledge of Homomorpism, Isomorphism of groups, Fundamental theorem of homomorphism, Caley's theorem.
- 4. Students will be enable to developing important skills in problem solving techniques of Rings, Subrings, Ideal, Integral domain and Field.
- 5. Students will be enable to stimulate interest in learnig of Group Automorphism, Cauchy's theorem and Conjugacy relation.

## Course outcomes (COS) Class : B.Sc. II Year Paper : II Title : Advaced Calculus Mathematics

In this course students will be enable to :

- 1. Analyzing and describing the behviour of sequences, limit. Cauchy's theorem, Tests of Convergence.
- 2. Students have a deeper understanding of Continuity, Mean value theorems and Darboux's value theorem.

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- 3. Students have a solid knowledge of partial differentiation, Euler's Taylor's theorem for function of two variables and Jacobians.
- 4. Students will be enable to developing important skill in problem solving method of Envelops, Evolutes, Maxima and Minima, Beta and Gamma Function.
- 5. Students will be enable to stimulate interest in learning of Double and triple integrals, volume and surface, change of order of integration.

## Course outcomes (COS) Class : B.Sc. II Year Paper : III Title : Differential Equations Mathematics

In this course students will be enable to :

- 1. Analyzing and describing the behavior of series solution, power series method, Bessel's, Legendre's equations and functions and their properties, Recurrence relations.
- 2. Students have a deeper understanding of Laplace Transformation and its properties, shifting theorems, differentiation and integration of transforms.
- 3. Students have a solid knowledge of inverse Laplace transform, convolution theorem, applications, initial value problem.
- 4. Students will be enable to developing important skills in problem solving of second order partial differential equation, Higher order partial differential equations, homogeneous and non homogenous equations, heat equation, laplace equation and equation of vibrating string.
- 5. Students will be enable to stimulate interest in learning of partial differential equation of Ist order, Lagrange's solution, general method, charpit's general method.

#### Course outcomes (COS) Class : B.Sc. III Year Paper : I Linear Algebra and Numerical

# Title : Linear Algebra and Numerical Analysis

The objective of this course is to provide understanding of vector space, Quotient space, Rank-Nullity Theorem and wide aspects of Numerical Analysis in which solution of equations, Interpolation and direct methods for solving systems of linear equations have been included.

- 1. Students will be able to define and give examples of vector spaces, subspaces, Linear span, Linear dependence and independence, Basis, Dimensions etc.
- 2. They will have the knowledge of linear transformation, inner product spaces, Quotient spaces, Cauchy-Schwartz inequality orthogonal and orthonormal sets.
- 3. Students will learn to find Eigen values and Eigen vectors of a matrix which is used in the study of chemical reactions and geometry.
- 4. They will be able to solve problems by using Regula-Falsi, Secant, Newton's methods and also will be able to find Interpolation and Numerical Quadrature.
- 5. Students would be able to solve system of linear equations by Elimination method, and ordinary differential equations by Euler's method, Runge-Kutta method, Milin-Simpson method.

# Course outcomes (COS) Class: B.Sc. III Year Paper: II Title: Real and Complex Analysis

The objective of this paper / course is to provide deep knowledge and understanding of Real and complex analysis.

- 1. Students will be able to define Riemann-Integral, Its properties, Improper Integrals, Its convergence, Fourier series, Frullani's Integra.
- 2. They will be able to prove mean-value theorem, Schwartz's and Young's theorem. Cantor's intersection theorem, Baire's category theorem.
- 3. Students will be able to define metric spaces, neighbourhoods, limit point, interior point, open and closed sets, uniform continuity, compactness, sequential compactness, connectedness etc.
- 4. Students will have the knowledge of complex numbers, Analytic functions, Harmonic functions, Fixed points, cross ratio and conformal mappings.

## Course outcomes (COS) Class : B.Sc. III Year Paper : III (optional) Title : Discrete Mathematics

The objective of this paper is to understand the topics of Discrete mathematics in which Boolean functions, lattice and types of it are included students will be able to make graphs and circuits.

- 1. Students will be able to define and identify various types of relations like binary relation, Inverse relation, composite and equivalence relation.
- 2. They would be able to differentiate among various types of sets like partially and totally ordered sets and lattices like dual and bounded lattice etc.
- 3. The students will be able to draw various graphs and circuits and would be able to find shortest paths.
- 4. Students would be able to state various properties of tree, rooted tree, binary tree, they will be able to find Rank and Nullity of Graph.
- 5. They would be able to write the algorithm, Kruskal's algorithm and prime algorithm

# M.sc. (Mathematics) Program Specific Outcome

- Students will be able to analyze the problems and interpret data for investigating problems in the field of Mathematics.
- Student of Mathematics can pursue higher studies (M.Phil., Ph. D) • to attain research positions. Students can get jobs in various fields both in the private and public sector. Some of the common job positions or profiles for a math enthusiast are Assistant Professor, Research Analyst, Assistant Scientist, Training Manager etc. They can apply for jobs in Banking sector, Aerospace and Defense, Automobile, IT and Software, Railways, and the Manufacturing sector. As Mathematician, one can be involved in research and development in specialized branches such as Commutative Algebra and Algebraic Geometry, Discrete Mathematics and Coding Theory, Groups, Semi groups and Topology, Applied Mathematics and Differential Equations, Functional Integration, Operator Theory/Operator Algebras, Mathematical Biology. Mathematics Education.
- Besides Industrial sector there are ample opportunities in Academics, like in School Education Department and Higher Education Department.
- Students will be able to understand the wide potential of the subject Mathematics, and its implementation in sustainable development.

# Syllabus

# **Post Graduate**

2021-2022

# Semester Pattern Subject: MATHEMATICS

	CONTENTS		Page No.
Post Graduate Level	Theory Paper	Semester I	1 - 5
	,, ,,	Semester II	6 - 10
	,, ,,	Semester III	11 - 15
	,, ,,	Semester Iv	16 - 21

Date of submission in Autonomous Examination cell:

Signature
<i>H.O.D.</i>

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Signature of Mamber of B.O.S.

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#### COURSE OUTCOMES SEMESTER-I

PaperI: The objective of this course is to provide Normal and subnormalAdvancedseries of groups and Perfect and Finite Fields.

- Abstract Algebra-I
- Students will be able to solve problems related to concept of groups, Nilpotent groups.
- Student will be able to facilitate the understanding of the structure of a problem where the problem involves a permutation group: e.g. Nature of the roots of a polynomial equation.

# Paper II: Real The objective of this course is to provide knowledge of<br/>AnalysisRiemann-Stieltjes integral and its properties

- Students will be able to solve problems related to convergence of series and sequence of functions.
- Students will be able to apply Implicit function and inverse function theorem.
- Students will be able to solve problems related to functions of several variables in Real Analysis.

# PaperIII: The objective of this course is to provide knowledge of Sets andTopology-ITopological Spaces.

- Students will be able to give proofs of Zorn's lemma and Lindelof's theorem.
- Students will be able define Countable and Uncountable sets and infinite sets.
- Students will be able to understand the concept of path connectedness and locally connected spaces.

Paper<br/>Complex<br/>AnalysisIV: The objective of this course is to provide knowledge of Complex<br/>Integration and ResiduesStudents will be able to proof Morera's Theorem,<br/>Cauchy\_Goursat theorem, Cauchy's Residue Theorem.

- Students will be able to state properties of Bilinear transformations.
- Students will be able to give definition and examples of conformal mappings.

PaperV:The objective of this course is to Students will be aware aboutAdvancedSemi groups ,Lattices, Boolean Algebra, and Graph Theory.DiscreteStudents will be able to understand the concept of

Homomorphism of Semi groups and monoids.

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- Students will be able to state properties of Lattices as Algebraic systems.
- Students will be able to understand the concept of Boolean Algebra to Switching theory.
- Students will be able to give definition and examples of Graph and its various Types.

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#### **COURSE OUTCOMES**

#### **SEMESTER-II**

Paper Advances Abstract Algebra-II	I:	<ul> <li>The objective of this course is to provide understanding of Modules and Algebra of Linear Transformation</li> <li>Students will be able to define and give examples of Modules, Sub-Modules, Cyclic modules and Primary modules.</li> <li>Students will be able to give proofs of Hilbert basis theorem, Noether_Laskar theorem and Wedderburn Artin theorem.</li> </ul>
Paper Lebesgue Measure Integration		<ul> <li>The objective of this course is to aware students about Lebesgue outer measure and integration of Non Negative Functions</li> <li>Students will be able to define and give examples of outer measure, Measurable sets, Convex functions and Uniform Convergence.</li> <li>Students will be able to proof Jensen's inequality, Holder and Minkowski inequalities.</li> <li>Students will be able to solve the problem related to Integration of series.</li> </ul>
Paper Topology-II	III:	<ul> <li>The objective of this course is to provide understanding of separation axioms, Net and Filters.</li> <li>Students will be able to define separation axioms, T0 ,T1 ,T2 ,T3 ,T4 spaces.</li> <li>Students will be able to state properties of separation</li> </ul>

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	<ul> <li>Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics</li> <li>(As Recommended by the Board of Studies) Session : 2021-22</li> <li>axioms and T0 ,T1 ,T2 ,T3 ,T4 spaces.</li> <li>&gt; Students will be able to solve Homotopy of paths, Compactness and proof of theorem of Algebra.</li> </ul>
Paper I Complex Analysis-II	<ul> <li>V: The objective of this course is to provide understanding of Gamma function and its Properties and Canonical Products.</li> <li>&gt; Students will be able to give proofs of Weierstrass Factorization theorem, Mittage –Leffler's Theorem, Bloch's theorem, Picard theorem.</li> <li>&gt; Students will be able to state Schwantz reflection Principle, Jenson's Formula Harmonic function</li> </ul>
Paper Advanced Discrete Mathematics-II	<ul> <li>V: The objective of this course is to provide knowledge about Matrix Representation and Theory of Automata.</li> <li>&gt; Students will be able to understand the concept of Discrete Numerical Functions.</li> <li>&gt; Students will be able to state properties of Lattices as Algebraic systems.</li> </ul>
	<ul> <li>Students will be able to understand the concept of Boolean Algebra to Switching theory.</li> <li>Students will be able to give definition and examples of Graph and its various Types.</li> </ul>

### **COURSE OUTCOMES**

#### **SEMESTER-III**

Paper I :Functional Analysis -I	<ul> <li>The objective of this course is to provide understanding about Normed Linear Spaces, subspaces and Linear Functionals.</li> <li>Students will be able to understand definition and properties of Normed linear spaces, Banach Spaces, Linear Operator, Linear functionals and Hibert Spaces.</li> <li>Students will be able solve examples of Banach Spaces and Dual Spaces.</li> <li>Students will be able to give the proof of Riesz's Lemma and understand compactness.</li> </ul>
Paper II: Integral Transform-I	<ul> <li>The objective of this course is make students understandable about Laplace Transform and Laplace equations in two dimensions.</li> <li>Students will be able to solve the problem of Laplace Transformation and Laplace Equation.</li> <li>Students will be able to apply differential equation, Integral equation and Heat conduction equation in one dimension</li> </ul>
-	<ul> <li>The objective of this course is to provide understanding of concept of Tree and Planar Graphs</li> <li>Students will be able to define Properties of Tree and Cut-Sets.</li> </ul>

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- Students will be able to understand Euler Graph , Hamiltonian Paths and Kuratowski's two graph .
- PaperIV: The objective of this course is to provide understanding of<br/>model in Operation & ResearchResearch> Students will be able to understand Characteristics of<br/>Operation & Research
  - Students will be able to solve Linear Programming Problem, Simplex Methods and Fundamental Property of Duality.

Paper V: Theory The objective of this course is to make students of Linear understandable about Spectral Theory and its properties of Operators-I Bounded Linear Operators

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- Students will be able to understand Regular Value Resolvent Set.
- Students will be able understand complex Banach Space and Banach Alegbra.
- Students will be able to understand properties of compact linear operators.

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### **COURSE OUTCOMES**

#### **SEMESTER IV**

Paper I: Functional Analysis -II	<ul> <li>The objective of this paper will give the students the fare idea of concept of Hilbert adjoint operator and Zorn's Lemma</li> <li>Student will be able to define and give examples self adjoint operator, Unitary operator, Normal operator and Positive operator.</li> </ul>
	Student will able to give proof of Hahn Banach Theorem, Category Theorem and Open mapping theorem.
	Student will able to define strong & weak convergence of operators.
Paper II: Integral Transform-II	The objective is to provide an understanding of various concepts of Fourier Transform
	Student will be able to solve problems related to Finite Fourier Transform and Boundary Value Problem.
	Student will be able to solve Convolution Theorem and Parseval's identity for Fourier Transform.
Paper III: Advanced Graph Theory-II	The objective is to demonstrate & Matrix Representation of Graphs and Trees as Directed Graph.
	> Students will develop ability to understand Cut set matrix

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and Chromatic Number.

- Students will able to solve Four color problem and fundamental Circuits in Digraphs.
- PaperIV: The objective of this paper is to give knowledge of solving<br/>various problem of operation researchResearch-IIVarious problem of operation research
  - Students will be able to solve Transportation problem, assignment problem and PERT/CPM path problem.
  - Students will be able to concept of Game theory and its solution by linear programming.

Paper V: Theory<br/>ofThe objective of this course is to aware students about further<br/>knowledge of Spectral properties of compact Linear operators,<br/>Positive operators and Projection operators.

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- Students will be able to solve theorems of Fredholm type and understand the concept of Bounded Self-adjoined Linear operators.
- Students will be able to perform product and square root of Positive operators.
- Students will be able to understand properties of Projection.

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Class		B.Sc. / B.A. I Year		
Subject	(English)	Mathematics		
Subject	(हिन्दी)	गणित	Paper No.: I	
Title of	(English)	Algebra and Trigonometry		
the paper	(हिन्दी)	बीजगणित एवं त्रिकोणमिति		
Compulsory	y Paper	er Medium of Teaching : Hindi, English		
Maximum	Marks	Total : 50		

Unit	Syllabus			
		Rank of matrix, Normal & Echelon form of a matrix, Characteristics		
	(English)	equations of a matrix, Eigen values, Eigen vectors, Linear		
<b>T</b> T <b>1</b> / <b>T</b>		Independence of row and column matrix.		
Unit I		आव्यूह की जाति, आव्यूह की प्रासामान्य एवं ऐसेलॉन रूप, आव्यूह का		
	(हिन्दी)	अभिलाक्षणिक समीकरण, आयगेन मान, सदिष, पंक्ति एवं स्तम्भ आव्यूह की		
		स्वतंत्रता।		
		Cayley Hamilton theorem and its use in finding inverse of a matrix,		
		application of matrix to solve a system of linear (homogenous and		
	(English)	non-homogenous) equations, theorems on consistency and		
		inconsistency of system of linear equations, solving linear equations		
Unit II		upto three unknown.		
		केली—हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रम आव्यूह (समघात एवं असमघात)		
	(हिन्दी)	ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय के हल के लिये		
	(18*41)	आव्यूह का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर		
		प्रमेय, तीन अज्ञात राषियों तक के रैखिक समीकरणों के हल।		
	Relation between the roots and coefficients of a general polynom			
	(English)	equation in one variable, transformation of equation. Reciprocal		
		equations, Descarte's rule of signs.		
Unit III	,d pj ds IkekU; cgqinksa ds lehdj.k ds xq.kkadksa ,			
	(हिन्दी)	ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k] O;qRØe		
	lehdj.k] fpUgksa dk fndkrsZa fu;eA			
		Logic – Logical connectives, Truth Tables, Tautology, Contradiction,		
	(English)	Logical Equivalance, Algebra of propositions, Boolean Algebra -		
definition and properties, Boolean Functions, switching				
Unit IV		its applications, logic gates and circuits.		
		तर्कषास्त्र – तर्क संयोजक, सत्यता सारणी, पुनरूक्ति और व्याघात, तार्किक		
	(हिन्दी)	तुल्यता, साध्यों का बीजगणित। बूलीय बीजगणित – परिभाषा एवं उसके गुणधर्म,		
		बूलीय फलन, स्विचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ।		

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Unit V	(English)	De-Moivre's theorem and its application, direct and inverse circular and hyperbolic functions, expansion of trigonometric functions, logarithm of complex quantities, Gregory's series, summation of trignometrical series.	
	(हिन्दी)	डी—मोइवर्स प्रमेय एवं इसके अनुप्रयोग, प्रत्यक्ष एवं व्युत्क्रम वृत्तीय एवं अतिपरवलयिक फलन त्रिकोणमितीय फलनों का विस्तार, सम्मिश्र संख्याओं का लघुगणक, ग्रीगोरी श्रेणी त्रिकोणमितीय श्रेणियों का योग।	

#### Text Books

- 1. S.L. Loney Plane Trigonometry Part II
- 2. K.B.Datta Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi 2000.
- 3. Chadrika Prasad A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd. Allahabad
- 4. C.L.Liu Elements of Discrete Mathematics (Second Edition), Mc Graw Hill, International Edition, Computer Science Series, 1986.
- 5.. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

- 1. H.S.Hall and S.R. Knight Higher Algebra H.M. Publication 1994.
- 2. N. Jacobson Basic Algebra Vol.I and II, W.H. Freeman.
- 3. I.S. Luther and I.B.S. Passi Algebra. Vol I and II, Narosa Publishing House
- 4. N. Saran and R.S. Gupta Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad.

# Theory

Class		B.Sc. / B.A. I Year		
Subject	(English)	Mathematics	Demon No. 4 H	
Subject	(हिन्दी)	गणित	— Paper No.: II	
Title of	(English)	Calculus and Differential Equations		
the paper	(हिन्दी)	कलन एवं अवकल समीकरण		
Compulsory Paper Medium of Teaching : Hindi, English			l	
Maximum	Marks	Total: 50		

Unit	Syllabus			
Unit I	(English)	Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.		
	(हिन्दी)	उत्तरोत्तर अवकलन, लैबनीज प्रमेय, मेक्लारिन एवं टेलर श्रेणी में विस्तार। अनंतस्पर्षी।		
Unit II	(English)	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curcves in Cartesian and polar coordinates.		
	(हिन्दी)	वक्रता, उत्तलता एवं अवतलता का परीक्षण, नति परिवर्तन बिन्दु, बहुबिन्दु, कार्तीय एवं ध्रुवीय निर्देषांकों में वक्रों का अनुरेखण।		
	(English)	Integration of transcendental functions, Definite Integrals, Reduction formulae, Quadrature, Rectification.		
Unit III	(हिन्दी)	vchth; Qyuksa dk lekdyu] fuf'pr lekdyu] lekU;u lw=] {ks=dyu ,oa pkidyuA		
Unit IV	(English) Linear differential equations and equations reducible to t form, Exact differential equation, first order and highe equations solvable for x, y and p, Chairaut's equation and solutions, geometrical meaning of a differential equation Orthogonal trajectories.			
	(हिन्दी)	रैखिक अवकलन समीकरण एवं रैखिक समीकरण में समानेंय अवकल समीकरण, यथातथ अवकल समीकरण x, y एवं p में हल होने योग्य प्रथम कोटि एवं उच्च धातीय अवकल समीकरण, क्लेरो का समीकरण और विचित्र हल। अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदिया।		

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Unit V	(English)	Linear differential equation with constant coefficient, Homogeneous linear ordinary differential equation, Linear differential equation of second order, transformation of equations by chainging the dependent variable / independent variable, method of variation of parameters.	
	(हिन्दी)	अचर गुणांकों वाले रैखिक अवकल समीकरण, साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण स्वतंत्र चर⁄परतंत्र चर के परिवर्तन द्वारा समीकरणों का रूपांतरण, प्राचल विचरा विधि।	

#### Text Books

- 1. Gorakh Prasad Differential Calculus, Pothishala Private Ltd. Allahabad
- 2. Gorakh Prasad Integral Calculus, Pothishala Private Ltd. Allahabad
- 3. D.A. Murray Introductory Course in Differential Equations, Orient Longman (India) 1967
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books** :

- 1. G.F. Simmons Differential Equations, Tata Mc Graw Hill, 1972
- 2. E.A. Codington An Introduction to ordinary differential equation, Prentice Hall of India, 1961
- 3. H.T.H. Piaggio Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, Delhi, 1985
- 4. S.G. Deo Differential Equations, Narosa Publishing House.
- 5. N. Pishkunov Differential and Integral Calculus, Peace Publishers, Moscow.

# Theory

Class		B.Sc. / B.A. I Year	
Subject	(English)	Mathematics	Domon No. A III
Subject	(हिन्दी)	गणित	Paper No.: III
Title of (English)		Vector Analysis and Geometry	
the paper (हिन्दी)		सदिष विष्लेषण एवं ज्यामिति	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus			
Unit I	(English)	Product of four vectors, Reciprocal vectors, vector differentiation, Gradient divergence and curl in Cartesian and cylindrical co- ordinates, Higher order derivatives, vector identities and vector equations.		
	(हिन्दी)	चार सदिषों का गुणन, व्युत्क्रम सदिष, सदिषअवकलन, कार्तीय एवं बेलनाकार निर्देषांकों में ग्रेडियट, डायवरजेन्स एवं कर्ल। उच्च कोटि अवकलज, सदिष समिकायें एवं सदिष समीकरण।		
<b>T 1 T</b>	(English)	<sup>glish)</sup> Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them. Application to geometry, curves in space, curvature and torsion, Serret – Frenet's formula.		
Unit II	(हिन्दी)	सदिष समाकलन, गॉस, ग्रीन एवं स्टोककी प्रमेय (बिना उपपत्ति) एवं इन पर आधारित प्रष्न। ज्यामिति में अनुप्रयोग, समष्टि में वक्र, वक्रता एवं मरोड़, सैरेट, फ्रेनेट सूत्र।		
	(English)	General equation of second degree, tracing of conics, system of conics, polar equation of a conic.		
Unit III	(हिन्दी)	f}rh; ?kkr ds O;kid lehdj.k] 'kkadoks dk vuqjs[k 'kkado fudk;] 'kkado dk /kzqoh; lehdj.kA		
Unit IV	(English)	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone, equation of cylinder and its properties.		
	(हिन्दी)	दिये गये आधार पर शंकु का समीकरण, शंकु के जनक, तीन परस्पर लम्बवत जनकों हेतु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का समीकरण और इसके प्रगुण।		

Unit V	(English)	Central conicoids, Paraboloid, eppipsoid, hyperboloid of one and two sheets and their properties.	
	(हिन्दी)	केन्द्रीय शांकवज, एक और द्वि—पृष्ठीय के परवलयज, दीर्घवृत्तज, अतिपरवलयज एवं उनके गुणधर्म।	

#### Text Books

1. N. Saran and S.N. Nigam – Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad

- 2. Gorakh Prasad and H.C. Gupta Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad
- 3. N. Saran and R.S.Gupta Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad (Unit IV)

**Reference Books** :

1. R.j.T. Bell – Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan

India Ltd., 1994 (Unit - V)

- 2. Murray R. Spiegel Theory and Problems of Advance Calculus, Schaum Publishing Company, New York.
- 3. Murray R. Spiegel Vector Analysis, Schaum Publishing Company, New York.
- 4. Shanti Narayan A Text Book of Vector Calculus, S. Chand & Co. New Delhi.
- 5. Shanti Narayan A Text Book of Vector Algebra, S. Chand & Co. New Delhi.
- 6. S.L. Loney The Elements of Coordinate Geometry, Macmillan and Company, London.
- 7. P.K. Jain and Khalil Ahmad A text book of Analytical Geometry of Two Dimensions, MacMillan Indian Ltd., 1994.
- 8. P.K. Jain and Khalil Ahmad A text book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1994.

# Theory

Class		B.Sc. / B.A. II Year		
Subject	(English)	Mathematics	Donon No. 1	
Subject	(हिन्दी)	गणित	– Paper No.: I	
Title of (English)		Abstract Algebra		
the paper (हिन्दी)		अमूर्त बीजगणित		
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English		
Maximum Marks		Total: 50		

Unit	Syllabus			
Unit I	(English)	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties		
	(हिन्दी)	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय समूह एवं सामान्य प्रगुण।		
	(English)	Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.		
Unit II	(हिन्दी)	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय, फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।		
	(English)	Homomorphism and Isomorphism of groups. Fundamental theorem of homomorphism. Transformation and Permutation group. $S_n$ (various subgroups of $S_n$ n < 5 to be studied). Cayley's theorem.		
Unit III	(हिन्दी)	$\label{eq:second} \begin{array}{ c c c c c c c c c c c c c c c c c c c$		
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of Automorphism, Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian gropus and non-abelian groups.		
	(हिन्दी)	समूह स्वकारिता, अंतः स्वाकारिता, स्वाकारिताओं का समूह, संयुग्मिता संबंध और केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन–आबेली समूह के लिये कौषी का प्रमेय।		

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Unit V	(English)	(hish) Definition and basic properties of rings, Ring homomorphism (subrings. Ideals and Quotient rings, Polynomial rings & its properties, Integral domain, principal ideal domain. Euclidean domains and unique factorization domains field and quotient fields.	
	(हिन्दी)	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण, पूर्णाकीय प्रांत मुख्य गुणजावली प्रांत, यूक्लिडियन प्रांत एवं अद्वितीय गुणन खंडीकरण प्रांत, क्षेत्र एवं विभाग क्षेत्र।	

#### Text Books

- 1. I.N.Herstein Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977
- 2. PB Bhattacharya, S.K. Jain and S R Nagpaul Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
- 3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books** :

- 1. Shantinarayan A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.
- 2. Surjeet Singh A Text Book of Modern Algebra.
- 3. N. Jacobson Basic Algebra, Vol, I and II, W. II. Freeman.
- 4. I.S. Luther and I.B.S. Passi Algebra. Vol I and II, Narosa Publishing House

Class		B.Sc. / B.A. II Year		
Subject	(English)	Mathematics	Deper No. 4 H	
Subject	(हिन्दी)	गणित	— Paper No.: II	
Title of (English)		Advanced Calculus		
the paper	(हिन्दी)	उच्च कलन		
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	l .	
Maximum Marks		Total: 50		

Unit	Syllabus	
Unit I	(English)	Definition of a sequence, Theorems on limits of sequences, Indeterminate Forms, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence, Absolute and conditional convergence of series of real and complex term, Rearrangment of series.
	(हिन्दी)	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, अनिर्धाय रूप, परिबद्ध एवं एकदिष्ट अनुक्रम कॉषी का अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉषी का समाकल परीक्षण, कॉषी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण। वास्तविक एवं समिश्र पदों की श्रेणियों का निरपेक्ष एवं प्रतिबंधमयी अभिसरण।
Unit II	(English)	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.
	(हिन्दी)	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलों के लिये डार्बू का मध्यवर्ती मान प्रमेय।
Unit III	(English)	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables, Jacobians.
	(हिन्दी)	nks pjksa ds Qyuksa dh Ihek ,oa IkarR;] vkaf'kd vodyu pjksa dk ifjorZu] le?kkr Qyuksa ij vk;yj dk izes;] nks pjksa ds Qyuksa ds fy;s Vsyj dk izes;] tsdksfc;uA

Unit IV	(English)	Envelops, Evolutes, Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.		
	(हिन्दी)	अन्वालोप, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लैग्रांज के गुणांकों की विधि, बीटा एवं गामा फलन।		
Unit V	(English) Double and triple integrals, volumes and surfaces of solids of revolution, Dirichlet's integrals, change of order of integration in double integrals.			
	(हिन्दी)	द्विक एवं त्रि—समाकल, ठोस के परिभ्रमण से जनित आयतन एवं पृष्ठ, ड्रीचलेंटस् समाकल द्विक समाकल के क्रम का परिवर्तन।		

#### Text Books

- 1. R.R. Goldbeg Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi
- 2. Gorakh Prasad Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad
- 3. Gorakh Prasad Integral Calculus, Pothishala Pvt. Ltd. Allahabad
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### Reference Books :

- 1. Gabriel Klaumber Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975
- 2. T.M. Apostol Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985
- 3. D. Soma Sundaram and B. Choudhary A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.
- 4. Murray R. Spiegel Theory and problems of advance Calculus, Schaum Publishing Co, New York.
- 5. O.E. Stanaitis An introduction to Sequences, Series and improper integrals.

## Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	Demon No III
Subject	(हिन्दी)	गणित	Paper No.: III
Title of	(English)	Differential Equations	
the paper	(हिन्दी)	अवकल समीकरण	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, Englis	h
Maximum Marks		Total: 50	

Unit	Syllabus		
Unit I	(English)	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.	
	(हिन्दी)	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।	
Unit II	(English)	Laplace Transformation. Linearity of the Laplace transformation.Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.	
	(हिन्दी)	लॉप्लास रूपांतरण, लॉप्लास रूपांतरण की रैखिकता, लॉप्लास रूपांतरण के लिये अस्तित्व प्रमेय। अवकलजों एवं समाकलों का लॉप्लाज रूपांतरण, स्थानांतर प्रमेय, रूपांतरणों का अवकलन एवं समाकलन।	
Unit III	(English)	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving, Initial value problems of second order linear differential equations with constant coefficients.	
	(हिन्दी)	izfrykse ykWlykl :ikarj.k] laoyu izes;] izkjafHkd eku leL;kvksa ds fy, f}rh; dksfV ds vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa ykWlykl :ikarj.kksa ds vuqiz;ksxA	

Unit IV	(English)	Partial differential equations of the first order, Lagrarange's solutions, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method.
	(हिन्दी)	प्रथम कोटि के आंषिक अवकल समीकरण, लैग्रांज विधि, विषिष्ट प्रकार के अवकल समीकरण का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरला से हल, चारपिट की व्यापक विधि।
Unit V	(English)	Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficient. Partial differential equations reducible to equations with constant co-efficients, equation of vibrating string, Heat equation, Laplace equation and their solutions.
	(हिन्दी)	द्वितीय व उच्च कोटि के आंषिक अवकल समीकरण, द्वितीय कोटि के आंषिक अवकल समीकरणों का वर्गीकरण अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों में समानेय आंषिक अवकल समीकरण, कम्पनेय डोरी का समीकरण, ऊष्मा समीकरण, लाप्लास समीकरण एवं इनके हल।

#### Text Books

1. Sharma and Gupta – Integral Transform, Pragati , Prakashan Meerut.

- 2. Sharma and Gupta Differential Equation, Pragati , Prakashan Meerut.
- 3. Raysinghania Differential Equaitons, S. Chand & Company, New Delhi
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books** :

1. D.A. Murray – Introductory course in differential equation, Orient Longman, India, 1967.

- 2. G.F. Simnons Differential Equations, Tata Mcgraw Hill, 1972.
- 3. E.A. Codington An introduction to Ordinary differential equations. Prentice Hall of India,1961
- 4. H.T.H. Piaggio Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.
- 5. E.D. Rainville Special Functions, The Macmillan Company, New York.

Theory			
Class		B.Sc. / B.A. III Year	
Ch-c	(English)	Mathematics	Daman Mars I
Subject	(हिन्दी)	गणित	Paper No.: I
Title of (English)		Linear Algebra and Numerical Analysis	
the paper (हिन्दी)		रैखिक बीजगणित एवं संख्यात्म	क विष्लेषण
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus	
Unit I	(English)	Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.
	(हिन्दी)	सदिष समष्टि की परिभाषा एवं उदाहरण उपसमष्टि उपसमष्टियां का योग एवं प्रत्यक्ष योग, रैखिक विस्तृति, रैखिक परतंत्रता, स्वतंत्रता एवं उनके मूल गुणधर्म आधार, आधार का अस्तित्व प्रमेय, विस्तार प्रमेय आधार में अवयवों की संख्या की अपरिवर्तनषील विमीय परिमित विमीय सदिष समष्टि का उपसमष्टि की पुरक उपसमष्टि का अस्तित्व उपसमष्टियों के योग की विमा, विभाग समष्टि एवं उसकी विमा।
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear-Quadratic and Hermitian forms.
	(हिन्दी)	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों की बीज गणित जाति शून्यता प्रमेय, आधार का परिवर्तन द्वैत समष्टि, द्विद्वैत समष्टि एवं प्राकृतिक तुल्याकारिता, एडज्वाइन्ट का रैखिक रूपांतरण, रैखिक रूपांतरणों के आइगन मान एवं आइगन सदिष, विकर्णीकरण, द्विएकघात, द्विघाती एवं हर्मितीय समघात।

		Innor Product Spaces Cauchy Schwartz incouslity orthogonal
	(English)	Inner Product Spaces – Cauchy-Schwartz inequality, orthogonal vectors, orthogonal complements, orthonormal sets and bases,
		Bessel's inequality for finite dimensional spaces, Gram-Schmidi
		orthogonalization process.
Unit III		vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd lfn'k]
	(हिन्दी)	ykafcr iwjd] izlkekU; ykafcd leqPp; ,oa vk/kkj] ifjfer
		foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV
		ykafcdrk izØeA
		Solution of Equations : Bisection, Secant, Regula Falsi, Newton's
		Methods Roots of second degree Polynomial equations.
	(English)	Interpolation : Lagrange interpolation, Divided differences,
		Interpolation formula using Differences, Numerical Quadrature,
Unit IV		Newtorn – Cote's formulae, Gauss Quadrature formulae.
		समीकरणों के हल – द्वि–विभाजन विधि, सिकेन्ट विधि, रेग्यूला फाल्सी विधि,
	(हिन्दी)	न्यूटन विधि, द्वितीय घात के बहुपद समीकरण के मूल। अर्न्तवेषन – लैग्रांज
	(~)	अर्न्तवेषन, विभाजित अंतर, अंतर के उपयोग से अर्न्तवेषन सूत्र संख्यात्मक
		क्षेत्रकलन न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र।
		Linear equations direct methods for solving systems of linear
		equations (Gauss elimination, L.U. decomposition, Cholesky
	(English)	decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction
Unit V		methods).
Chit v		Ordinary differential equations : Euler method, Single step method,
		Runge-Kutta's method, Multistep methods, Milne Simpson method,
		Methods based on Numercal integration, methods based on
		numerical differentiation.
	(हिन्दी)	रैखिक समीकरण, रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष
		विधियाः (गाउस विलोपन, एल–यू वियोजन, चोलेस्की वियोजन) पुनरावृत्ती
		विधियाँ (जकाबी विधि, गाउस सिडेल विधि), साधारण अवकल समीकरण
		आयलर विधि, एकल चरण विधि, रूंग कुट्टा विधि, बहुचरण विधि,
		मिलने–सिम्पसन विधि, संख्यात्मक समाकलन पर आधारित विधियाँ एवं
		संख्यात्मक अवकलन पर आधारित विधियाँ।

#### Text Books

K.B. Datta – Matrix and Linear Algebra, Prentice hall of India Pvt. Ltd, New Delhi, 2000.
 S.S. Sastry – Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

#### **Reference Books** :

- 1. K. Hoffman and R. Kunze Linear Algebra, 2<sup>nd</sup> Edition, Prentice Hall Englewood Cliffs New Jersey, 1971.
- 2. S.K. Jain. A Gunawardena & P.B. Bhattacharya Basic Linear Algebra with MATLAB Key College Publishing (Springer Verlag) 2001.
- 3. S, Kumarsaran Linear Alebra, A Bermetric Approach Prentice Hall of India, 2000.
- 4. Balaguruswamy Numerical methods, Tata Mc Graw Hill Publications, New York.

Class		B.Sc. / B.A. III Year	
C	(English)	Mathematics	Damar Na II
Subject	(हिन्दी)	गणित	– Paper No.: II
Title of	(English)	Real and Complex Analysis	
the paper	(हिन्दी)	वास्तविक एवं सम्मिश्र विष्लेषण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total: 50	

Unit	Syllabus		
Unit I	(English)	Riemann integral, Integrability of continuous and monotonicfunctions. The fundamental theorem of integral calculus, Meanvalue theorems of integral calculus, Partial derivatives anddifferentiability of real-valued functions of two variables,Schwartz's and Young's theorem, Implicit function theorem.	
	(हिन्दी)	रीमान समाकल, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान प्रमेय, दो चरों के वास्तविक मान फलनों के आंषिक अवकलज एवं अवकलनीयता, स्वार्ज एवं यंग के प्रमेय, अस्पष्ट फलन प्रमेय।	
Unit II	(English)	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullan's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.	
	(हिन्दी)	अनुचित समाकल एवं उनका अभिसरण तुलना परीक्षण आबेल एवं डिरिक्ले का परीक्षण, प्रचालिक फलनों के रूप में फ्रुलानी समाकल, सांतत्य, एक प्राचल के फलन के समाकल अवकलनीयता एवं समाकलनीयता, अर्द्ध एवं पूर्ण अंतरालों की फोरियर श्रेणी।	

		Definition and examples of metric spaces, Neighbourhoods, Limit
		points, interior points, Open and closed sets. Closure and
	(English)	interior, Boundary points, Subspace of metric space, Cauchy
	(English)	sequences, Completeness, Cantor's intersection theorem,
		Contraction principle, Real number as a complete ordered field.
		Dense subsets Baire Category theorem, Separable, second
		countable and first countable spaces.
Unit III		nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehl;] lhek
		fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd
		,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V]
	(हिन्दी)	dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;]
		ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod
		la[;k;sa] la?ku mileqPp; ck;j&dsVsxjh izes;]
		i`FkDdj.k] f}rh; x.kuh; ,oa izFke x.kuh; lef"VA
		Continuous functions, Extension theorem, Uniform continuity,
	(English)	Compactness, Sequential compactness. Totally bounded spaces.
		Finite intersection property, Continuous functions and compact
Unit IV		sets. Connectedness.
	(हिन्दी)	सतत फलन, विस्तार प्रमेय, एकसमान सांतत्य, संहतता, अनुक्रमणीय सहतता
		पूर्ण परिबद्ध समिष्टि, परिमित सर्वनिष्ठ प्रगुण, संतत फलन एवं संहत
		समुच्चय, संबद्धता।
	(English)	Complex numbers as ordered pairs, Geometric representation of
		complex numbers. Continuity and differentiability of compex
Unit V		function. Analytic functions, Cauchy-Reimann equations.
		Harmonic functionsMobius transformations. Fixed points, Cross
		ratio. Inverse points. Conformal Mappings.
		सम्मिश्र संख्या क्रमित युग्म के रूप में सम्मिश्र संख्या का ज्यामितिय निरूपण,
	(हिन्दी)	सम्मिश्र, फलनों की सातत्यता और अवकलनीयता, विष्लैषिक फलन,
		कौषी–रीमान समीकरण, प्रसंवादी फलन, मोबियस रूपांतरण, स्थिर बिन्दु
		तिर्यक अनुपात, प्रतिलोम बिन्दु, कॉनफार्मल फलन।

#### Text Books

- 1. Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi
- 2. G.J. Simmons Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963
- 3. L.V. Alhfors, complex analysis Mc Graw Hill, New York
- 4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### Reference Books :

- 1. Water Rudin Real and Complex Analysis Mc Graw Hill, New York.
- 2. Ponnusway Complex Analysis, Narosa Publication, New Delhi.
- 3. R.V. Churchill & J.W. Brown, Complex Variables and Application, 5<sup>th</sup> Edition, Mc Graw Hill, New York, 1990.

## Theory

Class		B.Sc. / B.A. III Year	
Subject	(English)	Mathematics	Daman Na A III
Subject	(हिन्दी)	गणित	Paper No.: III
Title of	(English)	Discrete Mathematics	
the paper	(हिन्दी)	विविक्त गणित	
<b>Compulsory Paper</b>		Medium of Teaching : Hindi, English	
Maximum	Marks	Total: 50	

Unit	Syllabus	
	(English)	Boolean functions – disjunctive & conjunctive normal forms(canonical & dual canonical), Bools's expansion theorem. Relations– Binary relation, Inverse relation, Composite relation, Equivalencerelation, Equivalence classes & its properties Partition of a set.
Unit I	(हिन्दी)	बूलीय फलन – वियोजनीय एवं संयोजनीय प्रसामान्य रूप (केनोनिकल एवं डूअल केनानिकल), बूल का विस्तार प्रमेय। संबंध – द्विचर संबंध, प्रतिलोम संबंध, संयोजित संबंध, तुल्यता संबंध, तुल्यता वर्ग एवं उसके गुण धर्म, समुच्चय का विभाजन।
Unit II	(English)	Partial order relation, Partially ordered sets, totally ordered sets. Hasse diagram, maximal and minimal element first and last element. Lattice – definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.
	(हिन्दी)	अंषतः क्रम संबंध, अंषतः क्रमित समुच्चय, पूर्णत क्रमित समुच्चय, हैसूह आरेख, उच्चिष्ठ एवं निम्निष्ठ अवयव, प्रथम एवं अन्तिम अवयव, जालक – परिभाषा एवं उदाहरण, द्वैत जालक, परिबद्ध जालक, वितरणीय जालक, पूरक जालक।
	(English)	Graph – Definition types of graphs, Subgraphs, walk-path, circuit, connected and disconnected graphs. Euler graph. Hamiltonian path and circuit, shortest path in weighted graph. Dijkstra's Algorithm for shortest paths.
Unit III	(हिन्दी)	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k] xeu] iFk ,oa ifjiFk laca) ,oa vlac) xzkQ vkW;yj xzkQ] gsfeYVksfu;u iFk vkSj ifjiFk] Hkkfjr vkys[k esa y?kqRre iFk gsrq MkWbtdL=k ,YxksfjFkeA

Unit IV	(English)	Trees and its properties, Rooted tree, Binary tree, Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.
	(हिन्दी)	वृक्ष एवं उसके गुण धर्म, नियत वृक्ष, द्विवचर वृक्ष, जनक वृक्ष, आलेख की जाति एवं शून्यता, कुस्कल एवं प्राइम की एल्गोरिथम।
Unit V	(English)	Matrix representation of graph – Incidence and Adjacency matrix. Cutset and its properties. Planar graphs (definition) Kuratowski's two graphs.
	(हिन्दी)	आलेख का आव्यूह निरूपण – इन्सीडेंस एवं एडजेन्सी आव्यूह , कटसेट्स एवं उसके प्रगुण, प्लानर आलेख (परिभाषा), कुराटोव्हस्की के द्विआलेख।

#### Text Books

- 1. C.L.Liu Elements of Discrete Mathematics, Mcgraw Hill, New-York
- 2. Narsingh Deo Graph Theroy, Prentice Hall
- 3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Theory

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## **M.Sc. SEMESTER I**

#### Theory

Class		M.Se	c / M.A.		Semester: I
S	ubject	Math	nematics		
Title o	of the paper	Advanced Ab	stract Algebra-I	Paper	No: I (Compulsory)
	of instructions	Er	nglish	Questi	ion Paper Language:
(16	eaching)				English
Maxin	num Marks	Total 100	Main Exam:	70	C.C.E: 30
Unit I	Normal & Sul series.	bnormal series	of groups, Comp	position s	series, Jordan-Holder
Unit II	Solvable & Nil	potent groups.			
Unit III			polynomials, A parable and insep	0	and transcendental tension.
Unit IV	Perfect fields, I	Finite fields, Alg	ebraically closed f	fields.	
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of GUnit Vtheory .Solution of polynomial equations by radicals, insolubility of ger equation of degree.5 by radicals.				
Recommen Book	2. P.B.	· -			, New Delhi. paul, Basic Abstract

#### Theory

Class		M.S		Semester:	Ι	
Subject		Mathematics				
Title of the pap	er	Real	Analysis	Paper I	No: II (Com	npulsory)
Medium of instructions (Teaching)		E	nglish	Quest	ion Paper La English	nguage:
Maximum Mar	ks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I			istence of Riema tion and differentia		ijes integral	and its
Unit II		0	vector-valued fu terms of a series. H	nctions, Riemann'	Rectifiable s theorem.	curves.
Unit III	conv M-t and	vergence, Caucl est, uniform co	eries of function ny criterion for uni onvergence and co eltjes integration,	iform con ntinuity,	vergence, W uniform cor	eierstrass nvergence
Unit IV	an o		l variables, linear R <sup>n</sup> Chain rule, par n theorem.			
Unit V	Derivatives of higher orders, Power series, uniqueness theorem power series, Abel's and Tauber's theorems. Implicit funct theorem,					
Recommended Books1. Walter Rudin, Principles of Mathematical Analysis, M Hill.					McGraw	
Reference       1. T.M. Apostal, Mathematical Analysis Narosa.         2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)					ion)	

#### Theory

Class		M.S	c / M.A.		Semester: I
Subject		Math	nematics		
Title of	f the paper	Тор	ology-I	Paper 1	No : III (Compulsory)
	of instructions aching)	Eı	nglish	Questi	ion Paper Language: English
Maxim	um Marks	Total: 100	Main Exam:	70	C.C.E: 30
Unit I	Unit I Countable and uncountable sets. Infinite sets and Axiom of Choice. Ca numbers and its arithmetic. Schroeder-Bernstein theorem. Stateme Cantor's theorem and the continuum hypothesis. Zorn's lemma. ordering theorem.				eorem. Statement of
Unit II	subsets. Neight	examples of topological spaces. Closed sets. Closure. Dense borhoods, interior exterior and boundary. Accumulation points ts. Bases and sub-bases, Subspaces and relative topology.			
Unit III	Alternate meth Operator and homeomorphis	d Neighborh		terms of Continuo	Kuratowski Closure ous functions and
Unit IV	Unit IV First and Second Countable spaces. Lindeiof's theorems. Separable sp Second Countability and Separability.				ns. Separable spaces.
Unit VPath- connectedness, connected spaces. Connected Components, Locally connected spaces.			onnected	ness on Real line.	
Recommend Books	2. G.F Mc	. Simmons, In Graw Hill.	ology- A first cour troduction to Top action to general to	pology a	nd Modern Analysis,

#### Theory

Class	Class		M.Sc / M.A.		Semest	Semester: I	
Subject		Mathematics					
Title of the paper		Complex Ana	alysis-I	Paper I (Comp			
Medium of (Teaching)	instruc	tions	English		Questic English	on Paper La 1	anguage:
Maximum I	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	-		gration, Caucl erivatives	y-Goursat theore	em. Cauc	hy integra	l formula,
Unit II			rem. Cauchy's ebra. Taylor's		ille's theorem. The fundamental		
Unit III	singu	larities. N	-	nciple. Schwartz le function theorem, orem.			
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches many valued functions with special reference to argz, log z, z^a.					ranches of	
Unit V	Jnit V Bilinear transformations, their examples of conformal mapping				classific	ation. Defii	nitions and
Recommended         Books       1. J.B. Conway, Functions of one complex variable, Spring				e, Springer	-verlag.		

#### Theory

Class		M.Sc / M.A.		Semest	er:	I
Subject		Mathematics				
Title of the	paper	Advanced Dis Mathematics-		Paper I	No: V(l) (d	optional)
Medium of (Teaching)	instructions	English		Questic English	on Paper L 1	anguage:
Maximum I	Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	semi groups a Direct product	nd monoids. C s. Basic Homon	o semi groups sub ongruence relation norphism Theorem	n and Q	uotient Se	mi groups.
Unit II		tems, sub latt	ly ordered sets, ices, Bounded la	-	-	
Unit III	Joint irreducil canonical form	ble elements, r ns, minimization	lgebras as lattice ninterms, maxtern n of Boolean funct (Using AND, OR,	ms, mint tions. Ap	term Bool plications	ean forms, of Boolean
Unit IV	Unit IV Graph Theory- Definition and types of graphs. Paths & circuits. Connect graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorith Trees, Properties of trees, Rooted & Binary trees, spanning trees, minin spanning tree.					Algorithm.
Unit V	sets & circuits	, Connectivity	ut-sets, properties and Separability, or planar graph		-	
Recommend Books	McC	Fraw Hill.	R. Manobar, Discr	ns, Preri		Structures,



## **M.Sc. SEMESTER II**

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#### Theory

Class	Class		M.Sc / M.A.		Semest	er: II	
Subject	Subject		Mathematics				
Title of the	paper		Advanced Ab	stract Algebra-II	Paper I	No : I	
Medium of (Teaching)	instruc	tions	English		Questic English	on Paper La	anguage:
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I				amples, sub modu a. Finitely generate	-		
Unit II	Simp	le module	s, Semisimple n	nodules, Free mod	ules, Sch	ur's lemma	ι.
Unit III			z Artinian m Artin theorem.	odules and rin	gs, Hilb	ert basis	theorem.
Unit IV				nodules, Noether- over a principal id			Indamental
Unit V	Jnit V Algebra of linear Reduction to triang			rity of linear tran	-		
Books Cam			bridge. Univers	S.K. Jain ,S K. Na ity Press, (Indian l in Algebra , Wiley	Edition)		0

#### Theory

Class	Class		M.Sc / M.A.		Semest	Semester: II		
Subject	Subject		Mathen	natics				
Title of the j	paper		Lebesqu Integra		asure &	Paper I	No : II	
Medium of i (Teaching)	instruc	tions	English			Questic English	on Paper La 1	anguage:
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I		0			asurable sets. Reg ility. Non-measura	•	leasurable	functions.
Unit II			0		functions. The Ge integrals.	eneral int	tegral. Inte	gration of
Unit III					unctions of Bo erentiation and int		variation.	Lebesgue
Unit IV	The L <sup>p</sup> -spaces, Convex functions, jensen's inequality. Holder and Minkov inequalities. Completeness of L <sup>p.</sup>				Minkowski			
Unit V	VDual of space when $1 \le P < \infty$ converge and almost uniform convergence.			e	leasure, u	uniform. Co	onvergence	
<b>V</b> oolza			Barra ,M Analysis		theory and integr yden.	ation .		

#### Theory

lass		M.Sc / M.A.		Semest	Semester: II	
Subject		Mathematics				
Title of the	paper	Topology-II		Paper I	No : III	
Medium of (Teaching)	f instructions	English		Questio	on Paper Lang English	guage:
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	-		2,T3,T4: their C Tietze extension th		rizations and	d basic
Unit II	compactness.	Compactness ar	nctions and comp nd finite intersection ets. Local compaction	on prope		
Unit III	characterizatio Connectedness	ons. Projection and product	y in terms of maps. Separation t spaces. Compa ility and product s	axioms actness	and product	spaces.
Unit IV	Compactness	and nets. Filte	d convergence of ers and their cor ice-versa.ultra-filt	vergence	e. Canonical	
Unit VThe fundamental group and covering spaces-Homotopy fundamental group. Covering spaces. The fundamental group the fundamental theorem of algebra.						
Recommen Books	nded Pvt 2. G.F Mc	. Ltd. New Delh 5 Simmons, Int Graw-Hill Book	troduction to Top	oology ai	nd Modern A	Analysis,

#### Theory

Class			M.Sc / M.A.		Semest	er:	II
Subject			Mathematics				
Title of the	e paper		Complex Ana	lysis-II	Paper 3	No : IV	
Medium of (Teaching)		tions	English		Questie English	on Paper L 1	anguage:
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I			ctorization the ann's function	orem. Gamma ar al equation	nd its prop	perties. Rie	mann Zeta
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of di analytic continuation. Uniqueness of analytic continuation along a cu Power series method of analytic continuation.						
Unit III				Harmonic funct m. Green's funct		c. Harnack	<b>x</b> inequality
Unit IV	Orde	r of an		s formula. Hada n. Exponent of orem.			
Unit V Schottky's th			eorem. Monte	tion. Bloch's theo l Caratheodary h conjecture and	and gro	eat Picard	
RecommendedBooks1. J.B.			Conway, Funct	ions of one comp	lex variab	le, Springe	r-Verlag.

#### Theory

Class		M.Sc / M.A. Semester: II				
Subject			Mathematics			
Title of the paper		Advanced Discrete Mathematics-II		Paper No : V(l) (optional)		
Medium of i (Teaching)	instruc	tions	English		Questic English	on Paper Language: 1
Maximum N	Aarks		Total: 100	Main Exam:	70	C.C.E: 30
Unit I	, circ	Matrix representation of graphs, incidence matrix Cut set matrix ,path matri , circuit matrix , Adjacency matrix , directed graphs definition of types directed graphs , Binary search trees.				
Unit II	Discrete numerical functions, Asymptotic behavior of numerical function, generating functions, Recurrence relations, linear Recurrence relations with constant coefficients, homogeneous solution, particular solution, tota solution.				irrence relations with	
Unit III	Computability and formal Languages , Languages , phrase structur Grammars derivation , sentential forms ,Language generated by gramma Regular, Context-Free, and Context* Sensitive Grammars.				nerated by grammar,	
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.				istic Finite Automata	
Unit V	Reduced machines , Kleen's Theorem (statement only )Pumping Lemma Moore and Mealy machines ,Turing Machine , Regular Expressions an corresponding Regular Language.( definition only )					
Recommend Books	led	1. J.P. 7 McGraw		8. Manobar, Disci	rete mat	hematical Structures,
2. N. Deo, Graph Theory with applications, Preritice-				y with application		ce-Hill



## **M.Sc. SEMESTER III**

#### Theory

Class		M.Sc / M.A. Semester: III				
Subject		Mathematics				
Title of the	paper		Functional Ar	nalysis-I	Paper I	No : I
Medium of i (Teaching)	Medium of instructions (Teaching)			English		on Paper Language: 1
Maximum N	Marks		Total: 100         Main Exam:         70         C.C.E:         30			C.C.E: 30
Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normo- linear spaces Basic Properties of finite dimensional normed linear spaces.				-	
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactn quotient space of normed linear spaces and its completeness.				-	
Unit III	Linea	Linear operator, Bounded linear operator and continuous operators.				s operators.
Unit IV	Linea	r function	nal, bounded lin	ear functional, Du	al spaces	s with examples.
Unit V		Hilbert space, orthogonal complements, orthonormal sets and sequence Representation of functional on Hilbert spaces.				sets and sequences.
Recommeno Books						
Reference	nce 1. B.Choudhary and Sudarshan Nanda, Functional Analysis applications Wiley Eastern Ltd.			ctional Analysis with		

#### Theory

Class			M.Sc / M.A.		Semest	er: II	[	
Subject			Mathen	natics				
Title of the paper		Integral Transform-I		Paper I	No : II			
Medium of instructions (Teaching)		English		Question Paper Language: English				
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivativ Shifting theorem, convolution Theorem.			lerivatives,				
Unit II	Application to Differential Equations, Application to Integral e Solution of simulates differential equations.			equations.				
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.				dimension			
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.				to Beams.			
Unit V	Heat conduction equation in one dimension, Application to heat conduction.			conduction				
Recommend Books	Books			egral Transforms by Goyal and Gupta. egral Transform by Sneddon.				

#### Theory

lass		M.Sc / M.A.	M.Sc / M.A.		ter: III	
Subject		Mathematics	5			
Title of the paper		Advanced G	raph Theory-I	Paper	No : III	
Medium of instructions (Teaching)		ns English	English		Question Paper Language: English	
Maximum	Marks	ks Total: 100 Main Exam:			C.C.E:	30
Unit I	Revision	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraph			ıbgraphs.	
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.				-	
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binar trees, Spanning trees, Fundamental circuits, spanning trees in a weighter graph.				v	
Unit IV		Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets connectivity and reparability.				cut-sets,
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.					
Recommended Books1. Graph theory with applications to Engineer Science by Narsingh Deo. Prentice Hall of India 2. Graph theory by Harary.			U	Computer		

#### Theory

Class			M.Sc / M.A.		Semest	er: III	
Subject			Mathematics				
Title of the	paper		<b>Operations</b> R	esearch-I	Paper N	No : IV	
Medium of instructions (Teaching)			English		Questio English	on Paper La	anguage:
Maximum I	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	-			scope, Origin and perations Researc		pment of (	Operations
Unit IIModel in Operations Research, Phil Limitations of Operation Research, Limitations			· -				
Unit III	Mathematical Formulation, Graphical Solution Method.						
Unit IV	Init IVGeneral Linear Programming Problem: Simplex Method exceptional artificial variable techniques; Big M method, two phase Method and Problems, problem of degeneracy.						
Unit V	Duali	ty, Funda	mental propert	ies of duality and t	heorem	of duality.	
Recomment Book	ended 1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations F Sultan Chand & Sons., New Delhi.				s Research,		
				ion Research. Lieberman, Indust	rial Eng	ineering S	eries. 1995.
		Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. ook comes with a CD containing software)					
3. G.Had		dley, Linear Programming, Narosa Publishing House, 1995.					
			Hadley, Linear and Dynamic programming, Addison-Wesley				
Reference		Reading	Mass.				
	5. H.A. Taha, operations research- An introduction, Mac Publishing Co. Inc., New York.				An intro	oduction,	Macmillan

6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

#### Theory

set and spectru Spectral Prope mapping theore	English Total: 100 y in finite dimo m. erties of Boun		(option Questic English 70 paces. Re	on Paper Language:	
structions arks Spectral Theor set and spectru Spectral Propo mapping theore	English Total: 100 y in finite dimo m. erties of Boun	Main Exam: ensional normed sj	(option Questic English 70 paces. Re	al) on Paper Language: n C.C.E: 30	
arks Spectral Theor set and spectru Spectral Prope mapping theore	Total: 100 y in finite dimo m. erties of Boun	ensional normed sj	English 70 paces. Re	C.C.E: 30	
Spectral Theor set and spectru Spectral Prope mapping theore	y in finite dimo m. erties of Boun	ensional normed sj	paces. Re		
set and spectru Spectral Prope mapping theore	m. erties of Boun		-	egular value resolvent	
mapping theor		dad Lincon Oner			
Spectral redius		Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.			
Spectral redius of a bounded linear operator on a complex banach spaceBanach Algebra, Further properties of Banach Algebras.					
Compact linear operators on normed spaces, further properties of com linear operators.			properties of compact		
Spectral prope	rties of compac	t linear operators.			
Recommended1. E. Kreyszing, Introductory functional analysis with appBooks1. E. Kreyszing, Introductory functional analysis with appJhon Wiley & Sons, New York 1978.2. G.F. Simmons, Introduction to Topology & Modern AnalyMcGraw Hill, New York,					
Multiplie 2. N. D science/V 3. G. Ba	Halmos, Introctuion to Hilbert space and the theory of spectral icity, socond Edition, Chelsea Publishing Co New York, 1957. Dund Ford and J.T. Schwartz. Linear operator-3 part inter Wile New Youk, 1958-74 achman and L. Narcil, Functional analysis for academic press				
	1. E. KJhon Wi2. G.F. SMcGraw1. P.R. HMultiplic2. N. Dscience/V3. G. Ba	1. E. Kreyszing, Intro         Jhon Wiley & Sons, Net         2. G.F. Simmons, Intro         McGraw Hill, New Yor         1. P.R. Halmos, Introct         Multiplicity, socond Ed         2. N. Dund Ford and         science/Wile New Youk	<ul> <li>Jhon Wiley &amp; Sons, New York 1978.</li> <li>2. G.F. Simmons, Introduction to Topole McGraw Hill, New York,</li> <li>1. P.R. Halmos, Introctuion to Hilbert sp Multiplicity, socond Edition, Chelsea Publ</li> <li>2. N. Dund Ford and J.T. Schwartz. science/Wile New Youk, 1958-74</li> <li>3. G. Bachman and L. Narcil, Functiona</li> </ul>	1. E. Kreyszing, Introductory functional analys         Jhon Wiley & Sons, New York 1978.         2. G.F. Simmons, Introduction to Topology & M         McGraw Hill, New York,         1. P.R. Halmos, Introctuion to Hilbert space and Multiplicity, socond Edition, Chelsea Publishing C         2. N. Dund Ford and J.T. Schwartz. Linear of science/Wile New Youk, 1958-74         3. G. Bachman and L. Narcil, Functional analys	



# **M.Sc. SEMESTER IV**

#### Theory

Class			M.Sc / M.A.		Semest	er: IV
Subject		Math		Mathematics		
Title of the	paper		Functional Ar	nalysis-II	Paper N	No : I
Medium of (Teaching)	edium of instructions eaching)		English		Questio English	on Paper Language:
Maximum I	Marks		Total:100Main Exam:70C.C.E:			C.C.E: 30
Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and norma operators positive operator.				Unitary and normal	
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.					
Unit III	Adjoint operators on normed spaces, relation between adjoint operator an Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.			0 I		
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.					
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.			nals, open mapping		
Recomment Books	1. E.Kreyszig, Introductory Functional Analysis with applicatioIndedJohn Wiley & Sons, New York 1978.2. G.F. Simmons, Introduction to Topology & Modern AnalyMcGraw Hill, New York.					
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis           applications, Wiley Eastern Ltd.			tional Analysis with		

#### Theory

Class			M.Sc / M.A.		Semest	er: IV	7	
Subject			Mathen	natics				
Title of the	e paper		Integral Transform-II		Paper 1	No : II		
Medium of (Teaching)	m of instructions ing)		English		-	Question Paper Language: English		
Maximum	Marks	Total: 100 Main Exam:		70	C.C.E:	30		
Unit I	Four	ırier Transform, Infinite Fourier transform, Complex Fourier transform.			ansform.			
Unit II	Finite	inite Fourier Transform and Fourier Integral.						
Unit III		Convolution theorem, Perseval's Identity for Fourier series, Parseva Identity for Fourier transform.			Parseval's			
Unit IV	Appli	cation for	Fourier	Trans	form to Boundary	v value pr	oblems.	
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundar value problems				Boundary			
Recommer Books	nended 1. Integral Transforms by Goyal and Gupta. 2. Integral Transforms by I.N. Sneddon. 3. Integral Transforms by Gupta and Vashishtha.							

#### Theory

lass		M.Sc / M.A.	M.Sc / M.A.		er: IV	
Subject	Subject		Mathematics			
Title of the paper		Advanced Gra	aph Theory-II	Paper 1	No : III	
Medium of instructions (Teaching)		English		Questio	Question Paper Language: English	
Maximum 1	Marks	larks Total: 100 Main Exam:			C.C.E:	30
Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G) Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.					
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacene matrix.			Adjacency		
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Covering matching's.			Coverings,		
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.				graphs and	
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraph Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.			Digraphs.		
Recommended Books1. Graph theory with applications to Engineering and c science by Narsingh Deo.2. Graph theory by Harary.			computer			

#### Theory

Class		M.Sc / M.A.		Semeste	er: IV
Subject		Mathematics	Mathematics		
Title of the	paper	Operations R	esearch-II	Paper N	No : IV
Medium of (Teaching)	instructions	English		Questio English	on Paper Language:
Maximum I	Marks	Total: 100	Main Exam:	70	C.C.E: 30
Unit ITransportation problems: North-West Corner Method Least-CosUnit IVogel's Approximation Method, MODI Method. Exceptionalproblem of degeneracy.					
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tuc Conditions, Non-negative constraints.				niques-Kuhn-Tucker
Unit III	Unit IIINetwork analysis, constraints in Network, Construction of network, Cri Path Method(CPM) PERT, PERT calculation, Resource Leveling by Netw Techniques and advances of network (PERT/CPM)				
Unit IV	Jnit IV Simulation: Monte-Carlo Simulation. Simulation of Networks, Advanta Limitation of Simulation.				vorks, Advantage and
Unit V	games withou		Mixed strategies, (		n-Minimax principle, l solution of 2xm and
Recomment Books	Sultan Chand & Song New Dolhi				Operations Research,
Reference	2. F.S (T	. Hiller and G.J. his book comes v	Sharma, Operations Research. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 is book comes with a CD containing Software) adley, linear programming, Narosa Publishing House, 1995.		
	<ol> <li>G.Hadley, linear and dynamic programming, Addison- Reading mass.</li> <li>H.A. Taha, Operations Research,- An Introduction Mac</li></ol>				

Session: 2020-21
Publishing.
6. Prem Kumar Gupta and D.S. Hira, Operations Research, an
Introduction S.Chand & Company Ltd., New Delhi.
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated
East-West Pvt, New Delhi, Madras.

#### Theory

Class		M.Sc / M.A.		Semester: IV		
Subject		Mathematics				
Title of the paper		Theory of Linear Operators-II		Paper No : V(l) (optional)		
Medium of instructions (Teaching)		English		Question Paper Language: English		
Maximum N	Marks		Total: 100	Main Exam:	70	C.C.E: 30
Unit I		-	al properties o act linear opera	-	operators	s, Operator Equation
Unit II			ems of Fredholm type, Bi-orthonormal system, Fredholm uicontinuous sequence, compact integral operator.			
Unit III	-		perties of Bounded Self-Adjoint linear operators, Further Bounded Self-Adjoint linear operators.			
Unit IV		-	tors: Product of positive operators, monotone sequences of djoint operators, square roots of positive operator.			
Unit V	•	Projection Operators: Product and sum of projections. Further properties projections.				
RecommendedJohn WiBooks2. G.F.		reyszing, Introductory Functional Analysis with Application, 'iley & Sons, New York, 1978. . Simmons, Introduction to Topology & Modern Analysis w Hill, New York.				
Reference Spectral 2. N.Du			R. Halmons, Introduction to Hilbert space and the theory of I Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957 und Ford and J.T. Schwartz, Linear operator-3 part inte Wiley, New York.			lishing co. Y.Y., 1957.

## Sarojini NaiduGovt.GirlsPostgraduate Autonomous college, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:......2017-2018.

#### Theory

Class		<b>M.Sc / M.A.</b>		Semester: I			
Subject		Mathematics					
Title of the paper		Advanced Abstract Algebra-I		Paper No: I (Compulsory)		oulsory)	
Medium of instructions		English		Question Paper Language:			
(16	(Teaching)				English		
Maxin	num Marks	Total 100	Main Exam:	70	C.C.E:	30	
Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.						
Unit II	Solvable & Nilpotent groups.						
Unit III		1 0	nomials, Algebraic inseparable extensi		nscendental ex	ttensions.	
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.						
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.						
Recommend Book	leu	Bhattacharya, S.	in Algebra, Wiley F K. Jain and S.R. N	ŕ		Algebra,	

#### Theory

Class		M.Sc / M.A.		Semester:	Ι
Subject		Mathematics			
Title of the paper		Real Analysis		Paper No: II (Compulsory)	
Medium of instructions (Teaching)		English		Question Paper Language: English	
ks	Total: 100	Main Exam:	70	C.C.E:	30
				jes integral	and its
Integration of vector-valued functions, Rectifiable curves Rearrangements of terms of a series. Riemann's theorem.					curves.
Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.					
Functions of several variables, linear transformations, Derivatives in an open subset of $\mathbb{R}^n$ Chain rule, partial derivatives, differentiation, and inverse function theorem.					
Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,					
Recommended Books1. Walter Rudin, Principles of Mathematical Analy Hill.					McGraw
Reference1. T.M. Apostal, Mathematical Analysis Narosa.2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)					ion)
	ks Defi proj Inte Rea Sequ conv M-te and diffe and diffe and pow theo 1 Fun	Image: Provide state of the state of th	Mathematics         er       Real Analysis         English       English         Ks       Total: 100       Main Exam:         Definition and existence of Riema properties, Integration and differentia       Integration of vector-valued further rearrangements of terms of a series. F         Sequences and series of function convergence, Cauchy criterion for uni M-test, uniform convergence and co and Riemann-Stieltjes integration, differentiation.       Functions of several variables, linear an open subset of R <sup>n</sup> Chain rule, par and inverse function theorem.         Derivatives of higher orders, Power power series, Abel's and Tauber's theorem,       1. Walter Rudin, Principles of Mathill.         1. T.M. Apostal, Mathematical Analysis, Mathematical Analysis, Mathill       1. T.M. Apostal, Mathematical Analysis, Mathill	Mathematics       Paper I         er       Real Analysis       Paper I         English       Quest         cs       Total: 100       Main Exam: 70         Definition and existence of Riemann-Stield properties, Integration and differentiation.       Integration of vector-valued functions, Rearrangements of terms of a series. Riemann'         Sequences and series of functions, point convergence, Cauchy criterion for uniform cord M-test, uniform convergence and continuity, and Riemann-Stieltjes integration, uniform differentiation.         Functions of several variables, linear transform an open subset of R <sup>n</sup> Chain rule, partial deriva and inverse function theorem.         Derivatives of higher orders, Power series, un power series, Abel's and Tauber's theorem theorem,         1. Walter Rudin, Principles of Mathematical Analysis National Analysis Natio	Mathematics       Paper No : II (Con         Err       Real Analysis       Paper No : II (Con         English       Question Paper La English         ss       Total: 100       Main Exam: 70       C.C.E:         Definition and existence of Riemann-Stieltjes integral properties, Integration and differentiation.       Integration of vector-valued functions, Rectifiable Rearrangements of terms of a series. Riemann's theorem.         Sequences and series of functions, point wise and convergence, Cauchy criterion for uniform convergence, WM-test, uniform convergence and continuity, uniform con and Riemann-Stieltjes integration, uniform converge differentiation.         Functions of several variables, linear transformations, Deri an open subset of R <sup>n</sup> Chain rule, partial derivatives, differ and inverse function theorem.         Derivatives of higher orders, Power series, uniqueness the power series, Abel's and Tauber's theorems. Implicit theorem,         1. Walter Rudin, Principles of Mathematical Analysis, Hill.         1. T.M. Apostal, Mathematical Analysis Narosa.         2. H.L. Royden , Real Analysis, Macmillan (Indian Edit

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Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S -----

Theory

Class		M.Sc / M.A.		Semester: I		
Subject		Mathematics				
Title of the paper		Topology-I		Paper No : III (Compulsory)		pulsory)
Medium of instructions (Teaching)		English		Question Paper Language: English		
Maxim	um Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardina numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.					Cantor's
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subs Neighborhoods, interior exterior and boundary. Accumulation points and deri sets. Bases and sub-bases, Subspaces and relative topology.					
Unit III	Alternate methods of defining a topology in terms of Kuratowski Clos           Operator and Neighborhood Systems. Continuous functions and homeomorphic					
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.					
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.					iponents,
Recommend Books	2. G.F Mc	Munkres, Topology- A first course. Prentice-hall of India. . Simmons, Introduction to Topology and Modern Analys Graw Hill. . Joshi, Introduction to general topology, Wiley Eastern.				

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Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ------

#### Theory

Class		M.Sc / M.A.		Semest	er: I	
Subject		Mathematics				
Title of the paper		Complex Analysis-I		Paper No : IV (Compulsory)		
Medium of instructions (Teaching)		English		Question Paper Language: English		
Maximum N	Maximum Marks		Main Exam:	70	C.C.E:	30
Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, High order derivatives					ula, Higher
Unit II		rem. Cauchy's inequality. Liouville's theorem. The fundamenta bra. Taylor's theorem.				undamental
Unit III		Aeromorphic f	ciple. Schwartz le unction theorem, rem.			
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.					es of many
Unit V Bilinear transference examples of con			ir properties and gs.	classific	ation. Defii	nitions and
Recommend Books		Conway, Functions of one complex variable, Springer-verlag.			rlag.	

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Note : Setting is to be Done Strictly From Recommended Books

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#### Theory

Unit I g	structions arks Semi groups & groups and mo		Main Exam:	Questio English 70	No : V(l) (oj on Paper La C.C.E:		
Medium of ins (Teaching) Maximum Ma Unit I	structions arks Semi groups & groups and mo	Mathematics-I English Total: 100 Monoids- sub s	Main Exam:	Questio English 70	n Paper La	nguage:	
(Teaching) Maximum Ma Unit I	arks Semi groups & groups and mo	Total: 100 Monoids- sub s		English 70			
Unit I g	Semi groups & groups and mo	Monoids- sub s			C.C.E:	30	
Unit I g	groups and mo		semi groups sub mo				
ſ		Homomorphisn	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of sem groups and monoids. Congruence relation and Quotient Semi groups. Direc products. Basic Homomorphism Theorem.				
Unit II s	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices						
Unit III i f	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Join irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.				s, canonical Algebra to		
Unit IV g	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.						
Unit V	Image: Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut- & circuits, Connectivity and Separability, Planar graphs, Kuratowski's graphs, Euler's formula for planar graph						
Recommended Books	McG	Tremblay & R. Manobar, Discrete mathematical Structur Graw Hill. Deo, Graph Theory with applications, Preritice-Hill.			Structures,		

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# **M.Sc. SEMESTER II**

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#### Theory

Class		M.Sc / M.A.		Semeste	er: II	
Subject		Mathematics				
Title of the	paper	Advanced Abs	tract Algebra-II	Paper N	No : I	
Medium of instructions (Teaching)		English		Questio English	n Paper Lai	nguage:
Maximum N	Maximum Marks		Main Exam:	70	C.C.E:	30
Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.					
Unit II	Simple modules	, Semisimple mo	odules, Free modu	les, Schur'	s lemma.	
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn Artin theorem.					edderburn-
Unit IV		•	modules, Noether ver a principal ide			ındamental
Unit V	Algebra of linear transformation, Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.					
Recomment Books	Camb	Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, oridge. University Press, (Indian Edition) erstein ,Topics in Algebra , Wiley Eastern , New Delhi.				ct Algebra,

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semest	er: II		
Subject	ject		Mathem	natics				
Title of the paper		Lebesque Measure & Integration		Paper N	Paper No : II			
Medium of instructions (Teaching)		English			Questio English	on Paper La	nguage:	
Maximum N	Aarks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.							
Unit II	Integration of Non-negative functions. The General integral. Integration of S Riemann and Lebesgue integrals.				n of Series,			
Unit III		Four deriv rem, Diffei			ns of Bounded va ntegration.	riation. Lo	ebesgue Diff	erentiation
Unit IV		The L <sup>p</sup> -spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L <sup>p</sup> .						
Unit V	Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence an almost uniform convergence.					rgence and		
Recommend Books	ecommended ooks 1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.							

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

lass		M.Sc / M.A.	M.Sc / M.A. Se				
Subject		Mathematics					
Title of the paper		Topology-II		Paper N	No : III		
Medium of instructions (Teaching)		English	English		Question Paper Language: English		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I		oms T <sub>0</sub> ,T <sub>1</sub> ,T <sub>2</sub> ,T <sub>3</sub> ma. Tietze extens	,T <sub>4</sub> : their Characte sion theorem.	erizations	and basic	properties.	
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially an countably compact compact sets. Local compactness.				-		
Unit III	characterizatio Connectedness	ns. Projection	<ul> <li>in terms of</li> <li>maps. Separation</li> <li>aces. Compactness</li> <li>uct space.</li> </ul>	axioms	and prod	uct spaces.	
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets.           Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.						
Unit V	The fundamental group and covering spaces-Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra.						
Recommer Books	nded Pvt 2. G.F Mc	nes R. Munkres Topology, A First Course. Prentice Hall of India . Ltd. New Delhi. F Simmons, Introduction to Topology and Modern Analysis, Graw-Hill Book Company. D.Joshi, Introduction to General Topology, Wiley Eastern.					

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / M.A.	Semester: II			
Subject			Mathematics				
Title of the	paper		Complex Analy	ysis-II	Paper N	No : IV	
Medium of (Teaching)	instruction	S .	English		Questio English	on Paper La	inguage:
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation						emann Zeta
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analy continuation. Uniqueness of analytic continuation along a curve. Power ser- method of analytic continuation.					v	
Unit III			on principle. H et problem. Gre	armonic function een's function.	on disc. H	Iarnack ine	equality and
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.						
Unit VThe range of an analytic function. Bloch's theorem. The little Picard theoUnit VSchottky's theorem. Montel Caratheodary and great Picard theorem. Univ function. Bieberbach conjecture and the ¼ –theorem.							
Recommended         Books         1. J.B. Conway, Functions of one complex variable, Springer-Verlag.				verlag.			

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semester: II		
Subject	Subject		Mathematics				
Title of the paper		Advanced Discrete Mathematics-II		Paper No : V(l) (optional)			
Medium of i (Teaching)	instruc	tions	English		Questio English	-	anguage:
Maximum N	larks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Jit I       Matrix representation of graphs, incidence matrix Cut set matrix , path matrix , Adjacency matrix , directed graphs definition of types of diagraphs , Binary search trees.						
Unit II	Unit II ,generating fun			, Asymptotic bel ence relations , lin eous solution , part	near Rec	urrence r	elations with
Unit III	deriv	ation , sen		guages , Languago anguage generated rammars.			
Unit IV	state	Acceptors	deterministic a	m & Languages de and Non-determini Fable & Diagrams.	stic Finit	e Automa	ta finite State
Unit V Reduced machines , Kl and Mealy machines , Regular Language.( def			hines ,Turing N	Aachine, Regular			
Recommend Books	led	McGraw	Hill.	R. Manobar, Disc			l Structures,
2. N. Dec			o, Graph Theory with applications, Preritice-Hill				

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Note : Setting is to be Done Strictly From Recommended Books.



## **M.Sc. SEMESTER III**

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Theory
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Class		M.Sc / M.A.		Semeste	Semester: III		
Subject	Subject						
Title of the j	paper	Functional An	alysis-I	Paper N	lo : I		
Medium of instructions (Teaching)		English	English		Question Paper Language: English		
Maximum N	/larks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I         Normed Linear spaces, Banach Spaces and examples. Properties of normed I spaces Basic Properties of finite dimensional normed linear spaces.					med linear		
Unit II		• • •	ivalent norms, Ri spaces and its com			mpactness.	
Unit III	Linear operato	r, Bounded linea	r operator and con	tinuous o	perators.		
Unit IV	Linear function	nal, bounded line	ar functional, Dual	spaces w	ith example	s.	
Unit V	-	, orthogonal co of functional on	omplements, ortho Hilbert spaces.	onormal	sets and	sequences.	
Recommended BooksWiley 2. G.I		Kreyszig, Introductory functional analysis with application, Jhon y & sons, New York 1978. F. Simmous, Introductions to Topology & Modern Analysis, Tata Graw Hill, New York.					
Reference1. B.Choudhary and Sudarshan Nanda, H applications Wiley Eastern Ltd.			ida, Fun	ctional Ana	alysis with		

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / M.A.		Semest	er: III		
Subject			Mathen	natics				
Title of the paper		Integral Transform-I		Paper I	No : II			
Medium of instructions (Teaching)		English		Question Paper Language: English				
Maximum N	Aarks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I		Laplace Transform, Inverse Laplace Transform. Transforms of derivatives. Shifting theorem, convolution Theorem.					lerivatives,	
Unit II	Application to Differential Equations, Application to Integral equations. Solu of simulates differential equations.					s. Solution		
Unit III	-	ce Equatio ve equatio		dimen	sion, Wave Equation	on in one	dimension A	Application
Unit IV	Appli	Application of Laplace Transform to electrical circuits, Application to Beams.						
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.					conduction		
Books			0		ns by Goyal and Gu 1 by Sneddon.	pta.		

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

lass			M.Sc / M.A.		Semest	er: III	
Subject	Subject		Mathematics				
Title of the	paper		Advanced Gra	ph Theory-I	Paper I	No : III	
Medium of instructions (Teaching)		English		Questio	Question Paper Language: English		
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Revisio	n of gra	oh theoretic pre	liminaries. Isomo	rphism of g	graphs, subg	raphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphscomponents, Euler Graphs, Operations of Graphs, Hamiltonian paths and cirThe traveling salesman problem.					-	
Unit III	-	-	,	nce and centers i ircuits, spanning	· · · · ·		•
Unit IV		s, Prope parability		et, Fundamental	circuits an	d cut-sets, c	onnectivity
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.					of a planer	
Recommended Books by N				applications to E rentice Hall of Ind rary.	0 0	and Compu	ter Science

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Note : Setting is to be Done Strictly From Recommended Books.

Class			M.Sc / M.A.		Semest	er: III	
Subject			Mathematics				
Title of the p	oaper		Operations R	esearch-I	Paper I	No : IV	
Medium of instructions (Teaching)		English		Question Paper Language: English			
Maximum N	Iarks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	-			scope, Origin and perations Research.	d Develo	opment of Op	perations
Unit II		-		rch, Phase of Op rch, Linear Program			lses and
Unit III	Mathema	atical F	ormulation, Gra	aphical Solution Me	ethod.		
			ole techniques;	g Problem: Simple Big M method, t cy.		-	-
Unit V	Duality,	Fundar	nental properties of duality and theorem of duality.				
Recommend Book	ed 1		i Swarup, PO.I an Chand & Soi	K. Gupta and Ma ns., New Delhi.	nmohan,	Operations I	Research,
2. F.S. I (This boo 3. G.Had			k comes with a ley, Linear Prog	on Research. Lieberman, Indus CD containing softw gramming, Narosa I I Dynamic program	ware) Publishin	g House, 1995.	

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#### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise /Yearly Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2019-2020.

5. H.A. Taha, operations research- An introduction, Macmillan Publishing
Co. Inc., New York.
6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East- West Pvt.Ltd.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class		M.Sc / M.A. S				Semester: III		
Subject			Mathematics					
Title of the paper		Theory of Linear Operators-I		Paper No : V(l) (optional)				
Medium of i (Teaching)	nstruc	tions	English		Questio English	on Paper La	anguage:	
Maximum N	Iarks		Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	-	ral Theory pectrum.	y in finite dimer	nsional normed spa	ces. Regu	ılar value	resolvent set	
Unit II	-	ral Proper em for pol		Linear Operators	resolvent	t and spect	ral mapping	
Unit III	-			near operator on a Banach Algebras.	complex	banach sp	ace. Banach	
Unit IV	Comp opera		operators on n	ormed spaces, furth	ier prope	erties of co	mpact linear	
Unit V	Spect	ral proper	ties of compact	linear operators.				
Recommend Books	led	Wiley &	reyszing, Introductory functional analysis with applications. Jhon z Sons, New York 1978. Simmons, Introduction to Topology & Modern Analysis Tata					
			7 Hill, New York,					
			Halmos, Introctuion to Hilbert space and the theory of spectral city, socond Edition, Chelsea Publishing Co New York, 1957.					
Reference		Dund Ford and J.T. Schwartz. Linear operator-3 part i Vile New Youk, 1958-74			part inter			
		3. G. Bao York 196		hman and L. Narcil, Functional analysis for academic press N				

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Note : Setting is to be Done Strictly From Recommended Books.



# **M.Sc. SEMESTER IV**

Signature of members of B.O.S ------

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Theory
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Class			M.Sc / M.A.		Semeste	Semester: IV		
Subject		Mathematics						
Title of the	paper		Functional Ana	alysis-II	Paper N	No : I		
Medium of (Teaching)	instructio	ons	English		Questio English	n Paper Language:		
Maximum N	Marks		Total: 100	Main Exam:	70	C.C.E: 30		
Unit I		•	operator and ve operator.	its properties, se	lf adjoint,	. Unitary and normal		
Unit II				Thorem for re e and normed lin		spaces, Hahn-Banach		
Unit III	•	-		spaces, relation ive spaces, Reflex		adjoint operator and lbert space.		
Unit IV	0	•		egory theorem, u nd weak converge		indedness theorem and med spaces.		
Unit V		0	sequences of o corem, contracti	-	ctionals, oj	pen mapping theorem,		
RecommendedWileyBooks2. G			Kreyszig, Introductory Functional Analysis with applications, John y & Sons, New York 1978. G.F. Simmons, Introduction to Topology & Modern Analysis Fraw Hill, New York.					
Reference			Choudhary and Sudarshan Nanda, Functional Analysis with cations, Wiley Eastern Ltd.					

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.		Semest	er: IV			
Subject		Mathematics						
Title of the	e paper		Integral Transform-II		Paper No : II			
Medium of instructions (Teaching)		English		Question Paper Language: English				
Maximum	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Fouri	er Transfo	orm, Infir	nite Fou	urier transform, (	Complex Fo	ourier trans	form.
Unit II	Finite	e Fourier T	<b>Transform</b>	n and F	Fourier Integral.			
Unit III		olution the er transfo	· · · · ·	erseval'	s Identity for Fou	rier series,	, Parseval's I	Identity for
Unit IV	Appli	cation for	Fourier 7	Fransfo	orm to Boundary	value prob	lems.	
Unit V		Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems						
Recommended		2. Inte	tegral Transforms by Goyal and Gupta. tegral Transforms by I.N. Sneddon.					
3. Int			tegral Transforms by Gupta and Vashishtha.					

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

lass			M.Sc / M.A.			Semester: IV		
Subject		Mathe	matics					
Title of the	paper		Advan	ced Gra	ph Theory-II	Paper 1	No : III	
Medium of i (Teaching)	instructio	ons	English		Question Paper Language: English			
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Matrix	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.						
Unit II	Cut-set matrix.		, Relatio	onships	among Af, Bf an	nd Cf, p	ath matrix,	Adjacency
Unit III	Chrom matchi		nber, cl	nromati	c Partitioning, chi	romatic	Polynomial,	Coverings,
Unit IV			-	·	ted graph, some ty s, Directed paths a	-		graphs and
Unit V	it V Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.					Digraphs.		
Recommended Books by N			ph theory with applications to Engineering and computer science Narsingh Deo. ph theory by Harary.					

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Note : Setting is to be Done Strictly From Recommended Books.

Theory	

Class		M.Sc / M.A.	M.Sc / M.A.			Semester: IV		
Subject		Mathematics	Mathematics					
Title of the J	paper	Operations Re	search-II	Paper N	lo : IV			
Medium of i (Teaching)	nstructions	English	English			nguage:		
Maximum N	Iarks	Total: 100	Main Exam:	70	C.C.E:	30		
Unit I	Transportation problems: North-West Corner Method Least-Cost Metho Vogel's Approximation Method, MODI Method. Exceptional cases and problem degeneracy.							
Unit II	0	t problems, Non-l Non-negative constr	0	ing Tec	hniques-Ku	uhn-Tucker		
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)							
Unit IV		Monte-Carlo Simu of Simulation.	ulation. Simulation	of Netw	vorks, Adv	antage and		
Unit V	games with	ory- Two persons, nout saddle points- 2 , solution by Linear 1	Mixed strategies, (					
Recommend Books	led	•	ti Swarup, P.K. Gupta and Manmohan, Operations Research, tan Chand & Sons, New Delhi.					
Reference	2. H	F.S. Hiller and G.J. (This book comes wi	Sharma, Operations Research. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 is book comes with a CD containing Software) adley, linear programming, Narosa Publishing House, 1995.					

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4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading
mass.
5. H.A. Taha, Operations Research,- An Introduction Macmillan
Publishing.
6. Prem Kumar Gupta and D.S. Hira, Operations Research, an
Introduction S.Chand & Company Ltd., New Delhi.
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-
West Pvt, New Delhi, Madras.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class		M.Sc / M.A. Semester: IV				
Subject			Mathematics			
Title of the paper		Theory of Linear Operators-II		Paper No : V(l) (optional)		
Medium of i (Teaching)	instruc	tions	English		Questio English	n Paper Language:
Maximum N	Aarks		Total: 100	Main Exam:	70	C.C.E: 30
Unit I			al properties o act linear operat		operators	s, Operator Equation
Unit II	Furth Alter			olm type, Bi-ort quence, compact int		l system, Fredholm rator.
Unit III			ties of Bounded -Adjoint linear		r operato	rs, Further Properties
Unit IV		-	-	positive operators, 1 pots of positive oper		sequences of bounded
Unit V	•	ction Ope ctions.	rators: Product	t and sum of pro	jections.	Further properties of
Recommended BooksWiley &2. G.F. S		Wiley &	eyszing, Introductory Functional Analysis with Application, John Sons, New York, 1978. Simmons, Introduction to Topology & Modern Analysis McGraw w York.			
Reference Multiplie 2. N.Du			Halmons, Introduction to Hilbert space and the theory of Spectral city, Second Edition, Chelsea Publishing co. Y.Y., 1957. Ind Ford and J.T. Schwartz, Linear operator-3 part inter Wiley, New York.			

Note : Setting is to be Done Strictly From Recommended Books.

**Course:** 

## **B.Sc. (3 Years Degree Course)**

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	(As recomi Sess		by Board ( 2019-2		ies)
	Sche	eme of ex	xaminatior	ו	
			Marks		
Theory	Title of paper	Theory	C.C.E	Total	Compulsory/Option
Papers		150	50	200	
	E	B.SC.I-YEA	R		I
Paper I	Algebra and Trigonometry	50			Compulsory
Paperll	Calculus & Differential Equations	50	50	200	Compulsory
Paper III	Vector Analysis & Geometry	50			Compulsory
	B.	SC. II YEA	AR		
Paper 1	Abstract Algebra	50			Compulsory
Paper II	Advanced Calculus	50	50	200	Compulsory
Paper III	Differential Equations	50			Compulsory
	B.	SC. III YE	AR		
Paper	Linear Algebra & Numerical Analysis	50			Compulsory
Paper	Real & Complex Analysis	50	50	200	Compulsory
Paper	Discrete Mathematics	50			Optional
S	ignature of members of E	3.0.S	 		

Scheme of examination

#### Course:

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M.Sc. (2 Years Degree Course)

		SEMESTER I					
Theory	Title of paper	Compulsory/Opt	Marks				
Papers		ional	Theor	C.C	Total		
			У	.E			
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100		
Paper II	Real Analysis	Compulsory	70	30	100		
Paper III	Topology-I	Compulsory	70	30	100		
Paper IV	Complex Analysis-I	Compulsory	70	30	100		
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100		
Paper VI	Job Oriented Project Work	Compulsory			50		
		SEMESTER II					
Paper I	Advanced Abstract Algebra- II	Compulsory	70	30	100		
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100		
Paper III	Topology-II	Compulsory	70	30	100		
Paper IV	Complex Analysis-II	Compulsory	70	30	100		

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Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
		SEMESTER III			
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
		SEMESTER IV			
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100
Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory			50
Paper VII	Internship	Compulsory			100

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# **Syllabus**

2019-2020

## Semester / Yearly Pattern Subject: MATHEMATICS

	CONTENTS		Page No.
Under Graduate Level			
	Theory Paper	B.Sc.I Year	1-6
	,, ,,	B.Sc.II Year	7 - 12
	,, ,,	B.Sc.III Year	13 - 19
Post Graduate Level			
	Theory Paper	Semester I	20 - 24
	,, ,,	Semester II	25 - 29
	,, ,,	Semester III	30 - 34
	,, ,,	Semester IV	35 - 40

Date of submission in Autonomous Examination cell:

		Signature
Signature of members of B.O.S	 	

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*H.O.D*.

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### Theory

Class		B.Sc. / B.A. I Year			
Subject	(English)	Mathematics		Paper No.: I	
Subject	¼fgUnh½	xf.kr	xf.kr Paper		
Title of	(English)	Algebra and Trigonor	Algebra and Trigonometry		
the paper	¼fgUnh½	chtxf.kr ,oa f=dks.kfefr			
Compulsory Paper		Medium of Teaching : Hi	ndi, English		
Maximum Marks		Total : 50Main Exam:C.C.E.:		C.C.E.:	

Unit		Syllabus	Recommended Books
	(English)	Rank of matrix, Normal & Echelon form of a matrix, Characteristics equations of a matrix, Eigen values, Eigen	
Unit I		vectors, Linear Independence of row and column matrix. vkO;wg dh tkfr] vkO;wg dh izklkekU; ,oa ,slsykWu	
	¼fgUnh ½	:i] vkO;wg dk vfHkyk{kf.kd lehdj.k] vk;xsu eku] Ifn'k] iafDr ,oa LrEHk vkO;wg dh Lora=rkA	
	(English)	Cayley Hamilton theorem and its use in finding inverse of a matrix, application of matrix to solve a system of linear (homogenous and non-homogenous) equations, theorems on consistency and inconsistency of a system of linear equations, solving linear equations upto three unknown.	
Unit II	¼fgUnh ½	dsyh&gSfeYVu izes; ,oa vkO;wg dk O;qRØe vkO;wg ¼le?kkr ,oa vle?kkr½ Kkr djus esa bldk mi;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy;s vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrrk ,oa vlaxrrk ij izes;] rhu vKkr jkf'k;ksa rd ds jSf[kd lehdj.kksa ds gyA	
Unit III	(English)	Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equation. Reciprocal equations, Descarte's rule of signs.	

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(As Recommended by the Board of Studies)

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		,d pj ds lkekU; cgqinksa ds lehdj.k ds xq.kkadksa	
	¼fgUnh ½	,oa ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k]	
	/2	O;qRØe lehdj.k] fpUgksa dk fndkrsZa fu;eA	
		Logic – Logical connectives, Truth Tables, Tautology,	
		Contradiction, Logical Equivalance, Algebra of propositions,	
Unit IV	(English)	Boolean Algebra – definition and properties , Boolean	
		Functions, switching circuits and its applications, logic gates	
		and circuits.	
		rdZ'kkL= & rdZ la;kstd] IR;rk lkj.kh] iqu:fDr vkSj	
	¼fgUnh	O;k?kkr] rkfdZd rqY;rk] lk/;ksa dk chtxf.krA cwyh;	
	1⁄2	chtxf.kr & ifjHkk"kk ,oa mlds xq.k/keZ] cwyh; Qyu]	
		fLopu ifjiFk ,oa mlds vuqiz;ksx] rdZ}kj ,oa ifjiFkA	
		De-Moivre's theorem and its application, direct and invese	
	(English)	circular and hyperbolic functions, expansion of trigonometric	
	(English)	functions, logarithm of complex quantities, Gregory's series,	
		summation of trignometrical series.	
Unit V		Mh&eksbolZ izes; ,oa blds vuqiz;ksx] izR;{k ,oa	
	¼fgUnh	O;qRØe o`Rrh; ,oa vfrijoyf;d QyuQ f=dks.kferh;	
	1⁄2	Qyuksa dk foLrkj] lfEeJ la[;kvksa dk y?kqx.kd]	
		xzhxksjh Js.kh f=dks.kferh; Jsf.k;ksa dk ;ksxA	

#### Text Books

- 1. S.L. Loney Plane Trigonometry Part II
- 2. K.B.Datta Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi 2000.
- 3. Chadrika Prasad A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd. Allahabad
- 4. C.L.Liu Elements of Discrete Mathematics (Second Edition), Mc Graw Hill, International Edition, Computer Science Series, 1986.

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5.. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

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#### Session: 2019-20

#### Reference Books :

- 1. H.S.Hall and S.R. Knight Higher Algebra H.M. Publication 1994.
- 2. N. Jacobson Basic Algebra Vol.I and II, W.H. Freeman.
- 3. I.S. Luther and I.B.S. Passi Algebra. Vol I and II, Narosa Publishing House
- 4. N. Saran and R.S. Gupta Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad.

Theory
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Class		B.Sc. / B.A. I Ye	ar		
Subject	(English)	Mathematics		Demos No II	
	<sup>1</sup> ∕₄fgUnh½	xf.kr	P	aper No.: II	
Title of	(English)	Calculus and Differential Equations			
the paper	¼fgUnh½	dyu ,oa vody lehdj.k			
Compulsory Paper		Medium of Teachir	ıg : Hindi, English		
Maximum	Marks	Total: 50	Main Exam:	C.C.E.:	

Unit		Syllabus	Recommended Books
	(English)	Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.	
Unit I	¼fgUnh ½	mRrjksRrj vodyu] yScuht izes;] esDykfju ,oa Vsyj Js.kh esa foLrkjA vuarLi'khZA	
	(English)	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curcves in Cartesian and polar coordinates.	
Unit II	¼fgUnh ⅓	oØrk] mRryrk ,oa voryrk dk ijh{k.k] ufr ifjorZu fcUnq] cgqfcUnq] dkrhZ; ,oa /kzqoh; funsZ'kkadksa eas oØksa dk vuqjs[k.kA	
	(English)	Integration of transcendental functions, Definite Integrals, Reduction formulae, Quadrature, Rectification.	
Unit III	¼fgUnh ½	vchth; Qyuksa dk lekdyu] fuf'pr lekdyu] lekU;u lw=] {ks=dyu ,oa pkidyuA	
Unit IV	(English)	Linear differential equations and equations reducible to the linear form, Exact differential equation, first order and higher	

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Session. 2019-20				
		degree equations solvable for x, y and p, Chairaut's equation		
		and singular solutions, geometrical meaning of a differential		
		equations, Orthogonal trajectories.		
		jSf[kd vodyu lehdj.k ,oa jSf[kd lehdj.k esa lekusa;		
		vody lehdj.k] ;FkkrFk vody lehdj.k x, y ,oa p esa gy		
	¼fgUnh ½	gksus ;ksX; izFke dksfV ,oa mPp /kkrh;Z vody		
	/2	lehdj.k] Dysjks dk lehdj.k vkSj fofp= gyA vody		
		lehdj.k dk T;kferh; vFkZ] ykafcd laNsfn;kA		
	(English)	Linear differential equation with constant coefficient,		
		Homogeneous linear ordinary differential equation, Linear		
		differential equation of second order, transformation of		
		equations by chainging the dependent variable / independent		
Unit V		variable, method of variation of parameters.		
		vpj xq.kkadksa okys jSf[kd vody lehdj.k] lk/kkj.k		
	¼fgUnh ½	jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd		
		vody lehdj.k Lora= @ pj ijra= pj ds ifjorZu }kjk		
		lehdj.kksa dk :ikarj.k] izkpy fopjk fof/kA		

#### Text Books

- 1. Gorakh Prasad Differential Calculus, Pothishala Private Ltd. Allahabad
- 2. Gorakh Prasad Integral Calculus, Pothishala Private Ltd. Allahabad
- 3. D.A. Murray Introductory Course in Differential Equations, Orient Longman (India) 1967
- 4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

#### Reference Books :

- 1. G.F. Simmons Differential Equations, Tata Mc Graw Hill, 1972
- 2. E.A. Codington An Introduction to ordinary differential equation, Prentice Hall of India, 1961
- 3.H.T.H. Piaggio Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, Delhi, 1985

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4. S.G. Deo – Differential Equations, Narosa Publishing House.

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5. N. Pishkunov – Differential and Integral Calculus, Peace Publishers, Moscow.

#### Theory

Class		B.Sc. / B.A. I Year			
Subject	(English)	Mathematics     Paper I       xf.kr     Paper I		Demon No III	
	<sup>1</sup> ∕₄fgUnh½			aper No.: III	
Title of	(English)	Vector Analysis and Geometry			
the paper	¼fgUnh½	lfn'k fo'ys"k.k ,oa T;kfefr			
Compulsory Paper		Medium of Teachi	ng : Hindi, English		
Maximum	Marks	Total: 50	Main Exam:	C.C.E.:	

Unit		Syllabus	Recommended Books
Unit I	(English)	Product of four vectors, Reciprocal vectors, vector differentiation, Gradient divergence and curl in Cartesian and cylindrical co-rodinates, Higher order derivatives, vector identities and vector equations.	
	¼fgUnh ½	pkj lfn'kksa dk xq.ku] O;qRÙe lfn'k] lfn'kvodyu] dkrhZ; ,oa csyukdkj funsZ'kdksa esa xzsfM;V] Mk;ojtsUl ,oa dyZA mPp dksfV vodt] lfn'k lfedk;s ,oa lfn'k lehdj.kA	
Unit II	(English)	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them. Application to geometry, curves in space, curvature and torsion, Serret – Frenet's formula.	

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		Ifn'k lekdyu] xkWl] xzhu ,oa LVksddh izes; ¼fcuk	
	¼fgUnh	miifÙk½ ,oa bu ij vk/kkfjr iz'uA T;kfefr esa	
	1/2	vuqiz;ksx] lef"V esa oØ] oØrk ,oa ejksM+] lSjsV]	
		ÝsusV lw=A	
	(English)	General equation of second degree, tracing of conics, system of	
	(English)	conics, polar equation of a conic.	
Unit III	¼fgUnh	f}rh; ?kkr ds O;kid lehdj.k] 'kkadoks dk vuqjs[k.k]	
	1⁄2	'kkado fudk;] 'kkado dk /kzqoh; lehdj.kA	
		Equation of cone with given base, generators of cone, condition	
Unit IV	(English)	for three mutually perpendicular generators, Right circular cone,	
		equation of cylinder and its properties.	
		fn;s x;s vk/kkj ij 'kadq dk oehdj.k] 'kadq ds tud] rhu	
	¼fgUnh ½	ijLij yEcor tudksa gsrq izfrc?k] yEco`Rrh; 'kadq]	
	/2	csyu dk lehdj.k vkSj blds izxq.kA	
	(English)	Central conicoids, Paraboloid, eppipsoid, hypterboloid of one	
	(English)	and two sheets and their properties.	
Unit V	¼fgUnh	dsUnzh; 'kkadot] ,d vkSj f}&i`"Bh; ds ijoy;t]	
	1⁄2	nh?kZo`Rrt] vfrijoy;t ,oa muds xq.k/keZA	

#### Text Books

- 1. N. Saran and S.N. Nigam Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad
- 2. Gorakh Prasad and H.C. Gupta Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad
- 3. N. Saran and R.S.Gupta Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad (Unit IV)

#### Reference Books :

- 1. R.j.T. Bell Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit V)
- 2. Murray R. Spiegel Theory and Problems of Advance Calculus, Schaum Publishing Company, New York.

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(As Recommended by the Board of Studies) Session: 2019-20

3. Murray R. Spiegel – Vector Analysis, Schaum Publishing Company, New York.

4. Shanti Narayan - A Text Book of Vector Calculus, S. Chand & Co. New Delhi.

- 5. Shanti Narayan A Text Book of Vector Algebra, S. Chand & Co. New Delhi.
- 6. S.L. Loney The Elements of Coordinate Geometry, Macmillan and Company, London.
- 7. P.K. Jain and Khalik Ahmad A text book of Analytical Geometry of Two Dimensions, MacMillan Indian Ltd., 1994.
- 8. P.K. Jain and Khalik Ahmad A text book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1994.

#### Theory

Class		B.Sc. / B.A. II Y	ear		
Subject	(English)	Mathematics Depart No.			
	<sup>1</sup> ∕₄fgUnh½	xf.kr Paper No.: I		Der NO.: I	
Title of	(English)	Abstract Algebra			
the paper	¼fgUnh½	vewrZ chtxf.kr			
Compulsory Paper		Medium of Teaching : Hindi, English			
Maximum Marks		Total : 50	Main Exam:	C.C.E.:	

Unit		Syllabus	
Unit I	(English)	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties	
	¼fgUnh ½	lewg dh ifjHkk"kk ,oa lkekU; izxq.k] milewg] mileqPp; ls tfur milewg] pØh; lewg ,oa lkekU; izxq.kA	
Unit II	(English)	Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.	

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(As Recommended by the Board of Studies) Session: 2019-20

	¼fgUnh	IgleqPp; fo;kstu] ySxzkat izes; ,oa bldh miizes;]	
	1⁄2	izlkekU; milewg] foHkkx lewgA	
Unit III	(English)	Homomorphism and Isomorphism of groups. Fundamental	
		theorem of homomorphism. Transformation and Permutation	
		group. $S_n$ (various subgroups of $S_n$ $n < 5$ to be studied).	
		Cayley's theorem.	
	¼fgUnh ½	lewgksa dh lekdkfjrk ,oa rqY;kdkfjrk] lekdkfjrk dk	
		ewyHkwr izes;] :ikUrj.k ,oa Øep; lewg $S_n$ ¼ $S_n$ ds	
		fofHkUu milewg] ladfYir gS fd $n < 5 \frac{1}{2}$ dSyh izes;A	
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of	
		Automorphism, Conjugacy relation and Centraliser. Normaliser.	
		Counting principle and class equation of a finite group.	
		Cauchy's theorem for finite abelian gropus and non-abelian	
		groups.	

	¼fgUnh ⅓	lewg Lodkfjrk] var% Lokdkfjrk] Lokdkfjrkvksa dk	
		lewg] la;qfXerk laca/k vkSj dsUnzh;dkjd]	
		izlkekU;d] x.kuk fl)kar ,oa ifjfer lewg dk oxZ	
		lehdj.kA ifjfer vkcsyh ,oa vu&vkcsyh lewg ds fy;s	
		dkS'kh dk izes;A	
Unit V	(English)	Definition and basic properties of rings, Ring homomorphism	
		subrings. Ideals and Quotient rings, Polynomial rings & its	
		properties, Interal domain and Field.	
	¼fgUnh ½	oy; dh ifjHkk"kk ,oa lkekU; izxq.k] oy; lekdkfjrk]	
		mioy;] xq.ktkoyh ,oa foHkkx oy;] cgqin oy; ,oa	
		mlds izxq.k] iw.kkZdh; izkar ,oa {ks=A	

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#### Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies) Session: 2019-20

#### Text Books

- 1. I.N.Herstein Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977
- 2. PB Bhattacharya, S.K. Jain and S R Nagpaul Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
- 3. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

#### Reference Books :

1. Shantinarayan – A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.

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- 2. Surjeet Singh A Text Book of Modern Algebra.
- 3. N. Jacobson Basic Algebra, Vol, I and II, W. II. Freeman.
- 4. I.S. Luther and I.B.S. Passi Algebra. Vol I and II, Narosa Publishing House

(As Recommended by the Board of Studies) Session: 2019-20 Theory

Class		B.Sc. / B.A. II Yes	ar	
Cubicot	(English)	Mathematics	De	ar Na - II
Subject	<sup>1</sup> ∕₄fgUnh½	xf.kr	Pa	per No.: II
Title of	(English)	Advanced Calcul	us	
the paper	¼fgUnh½	mPp dyu		
Compulsory Paper		Medium of Teaching	g : Hindi, English	
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		Syllabus	Recommended Books
	(English)	Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence.	
Unit I	¼fgUnh ½	vuqØe dh ifjHkk"kk] vuqØe dh lhek ij izes;] ifjc) ,oa ,dfn"V vuqØe dkW'kh dk vfHklj.k ekin.M] vkkRed inksa dh Js.kh] rqyuk ijh{k.k] dkW'kh dk lekdy ijh{k.k] dkW'kh dk ewy ijh{k.k] vuqikr ijh{k.k] jkch dk ijh{k.k] y?kqx.kdh; ijh{k.k] ,dkUrj Js.kh] fycuht ijh{k.k] fujis{k ,oa izfrca/kh vfHklj.kA	
Unit II	(English)	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.	
	¼fgUnh ½	IkarR; ¼,d pj Qyu½] vuqØe.kh; IkarR;k] larr Qyuksa ds xq.k/keZ],d leku IkarR;] vodyuh;rk dk J`a[kyk fu;e] e/;eku izes; ,oa mudk T;kehrh; vFkZ] vodyksa ds fy;s MkcwZ dk e/;orhZ eku izes;A	

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#### Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies) Session: 2019-20

		Limit and continuity of functions of two variables. Partial	
	(English)	differentiation, Change of variables. Euler's theorem on	
	(English)	homogeneous functions. Taylor's theorem for functions of two	
		variables, Jacobians.	
Unit III		nks pjksa ds Qyuksa dh lhek ,oa lkarRp] vkaf'kd	
	¼fgUnh	vodyu pjksa dk ifjorZu] le?kkr Qyuksa ij vk;yj dk	
	1⁄2	izes;] nks pjksa ds Qyuksa ds fy;s Vsyj dk izes;]	
		tsdksfc;uA	
		Envelops, Evolutes, Maxima and Minima of functions of two	
Unit IV	(English)	variables. Lagrange's multiplier method. Beta and Gamma	
		Functions.	
		vUokyksiZ] dsUnzt] nks pjksa ds Qyuksa dk	
	¼fgUnh ½	mfPp"B ,oa fufEu"B] ySxzkat ds xq.kkadksa dh	
	, 2	fof/k] chVk ,oa xkek QyuA	
		Double and triple integrals, volumes and surfaces of solids of	
	(English)	revolution Dirichlet's integrals, change of order of integration in	
		double integrals.	
Unit V		f}d ,oa f=&lekdy] Bksl ds ifjHkze.k ls tfur vk;ru ,oa	
	¼fgUnh ⅓	iz"B] MªhpysaVI~ lekdy f}d lekdy ds Øe dk	
	12	ifjorZuA	

#### Text Books

1. R.R. Goldbeg - Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi

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- 2. Gorakh Prasad Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad
- 3. Gorakh Prasad Integral Calculus, Pothishala Pvt. Ltd. Allahabad
- 4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

#### Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies)

#### Session: 2019-20

#### Reference Books :

- 1. Gabriel Klaumber Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975
- 2. T.M. Apostol Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985
- 3. D. Soma Sundaram and B. Choudhary A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.
- 4. Murray R. Spiegel Theory and problems of advance Calculus, Schauma Publishing Co, New York.
- 5. O.E. Stanaitis An introduction to Sequences, Series and improper integrals.

## Theory

Class		B.Sc. / B.A. II Ye	ear		
Cubicot	(English)	Mathematics		Dener Ne - III	
Subject	¼fgUnh½	xf.kr	Paper No.:		
Title of	(English)	<b>Differential Equa</b>	ations		
the paper	¼fgUnh½	vody lehdj.k			
Compulso	ry Paper	Medium of Teachin	g : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:	

Unit		Syllabus	Recommended Books
	(English)	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.	
Unit I	¼fgUnh ½	vody lehdj.k dk Js.kh gy] ?kkr Js.kh gy] csly ,oa ystsUM <sup>a</sup> s lehdj.k] csly ,oa ystsUM <sup>a</sup> s Qyu ,oa muds xq.k/keZ] iqujko`Rr ,oa tud Qyu] Qyu dh ykfEcdrkA	
Unit II	(English)	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.	
	¼fgUnh ½	ykWlykl :ikarj.k] ykWlykl :ikarj.k dh jSf[kdrrk] ykWlykl :ikarj.k ds fy;s vfLrRo izes;A vodytksa ,oa	

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(As Recommended by the Board of Studies) Session: 2019-20

Session: 2019-20					
	lekdyksa dk ykWlykt :ikarj.k] LFkkukarj izes;]				
	ikarj.k dk vodyu ,oa lekdyuA:				
	Inverse Laplace transforms, Convolution theorem. Application				
(English)	of Laplace transformation in Solving linear differential				
	equations with constant coefficients.				
	izfrykse ykWlykl :ikarj.k] laoyu izes;] vpj				
¼fgUnh ¼	xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy				
/2	djus esa ykWIykI :ikarj.kksa ds vuqiz;ksxA				

		Partial differential equations of the first order, Lagrarange's	
		solutions, Some special types of equations which can be solved	
Unit IV	(English)	easily by methods other than the general method, Charpit's	
		general method.	
		izFke dksfV ds vkaf'kd vody lehdj.k] ySxzkat fof/k]	
	¼fgUnh	fof'k"V izdkj ds vody lehdj.k dk O;kid fof/k ds	
	1/2	vfrfjDr vU; fof/k }kjk ljyk ls gy] pkjfiV dh O;kid	
		fof/kA	
		Partial differential equations of second and higher orders.	
		Classification of partial differential equations of second orde.	
	(English)	Homogeneous and non-homogeneous equations with constant	
		coefficient. Partial differential equations reducible to equations	
Unit V		with constant co-efficients.	
		f}rh; o mPp dksfV ds vkaf'kd vody lehdj.k] f}rh;	
	¼fgUnh	dksfV ds vkaf'kd vody lehdj.kksa dk oxhZdj.k vpy	
	1⁄2	xq.kkadksa ds le?kkr ,oa vle?kkr lehdj.k] vpj	
		xq.kkadksa esa lekus; vkaf'kd vody lehdj.kA	

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## Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies)

#### Session: 2019-20

#### Text Books

- 1. Sharma and Gupta Integral Transform, Pragati , Prakashan Meerut.
- 2. Sharma and Gupta Differential Equation, Pragati , Prakashan Meerut.
- 3. Raysinghania Differential Equaitons, S. Chand & Company, New Delhi
- 4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

#### Reference Books :

- 1. D.A. Murray Introductory course in differential equation, Orient Longman, India, 1967.
- 2. G.F. Simnons Differential Equations, Tata Mcgraw Hill, 1972.
- 3. E.A. Codington An introduction to Ordinary differential equations. Prentice Hall of India,1961
- 4. H.T.H. Piaggio Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.
- 5. E.D. Rainville Special Functions, The Macmillan Company, New York.

		Iheory			
Class		B.Sc. / B.A. III Year			
(English)		Mathematics	De		
Subject	¼fgUnh½	xf.kr	Pa	per No.: I	
Title of	(English)	Linear Algebra and Numerical Analysis			
the paper	¼fgUnh½	jSf[kd chtxf.kr ,oa la[;kRed fo'ys"k.k			
Compulsory Paper		Medium of Teaching : Hindi, English			
Maximum Marks		Total : 50	Main Exam:	C.C.E.:	

Unit		Syllabus	Recommended Books
Unit I	(English)	Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linera dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.	

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(As Recommended by the Board of Studies) Session: 2019-20

	¼fgUnh ½	Ifn'k lef"V dh ifjHkk"kk ,oa mnkgj.k milef"V milef"V;ka dk ;ksx ,oa izR;{k ;ksx] jSf[kd foLr`fr] jSf[kd ijra=rk] Lora=rk ,oa muds ewy xq.k/keZ vk/kkj] ifjfer foeh; Ifn'k lef"V;kj] vk/kkj dk vfLrRo izes;] foLrkj izes; vk/kkj esa vo;oksa dh la[;k dh vifjorZu'khy foeh; ifjfer foeh; Ifn'k lef"V dk milef"V dh iqjd milef"V dk vfLrRo milef"V;ksa ds ;ksx dh foek] foHkkx lef"V ,oa mldh foekA	
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear- Quadratica and Hermitian forms.	

		jSf[kd :ikarj.k ,oa udk vkO;wg fu:i.k] jSf[kd	
		:ikarj.kksa dh cht xf.kr tkfr 'kwU;rk izes;] vk/kkj dk	
	¼fgUnh	ifjorZu }Sr lef"V] f}}Sr lef"V ,oa izkd`frd rqY;kdkfjrk]	
	1/2	jSf[kd :ikarj.k dk layXu :ikarj.k] jSf[kd :ikarj.kksa ds	
		vkbxu eku ,oa vkbxu lfn'k] fod.khZdj.k] f},d?kkr]	
		f}?kkrh ,oa gfeZrh; le?kkrA	
		Inner Product Spaces – Cauchy-Schwartz inequality, orthogonal	
	(English)	vectors, orthogonal complements, orthonormal sets and bases,	
	(English)	Bessel's inequality for finite dimensional spaces, Gram-Schmidi	
Unit III		orthogonalization process.	
	¼fgUnh	vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd	
	1⁄2	lfn'k] ykafcr iwjd izlkekU; ykafcd leqPp; ,oa vk/kkj]	

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(As Recommended by the Board of Studies) Session: 2019-20

Image: constraint of the system of the sys			ifjfer foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV	
Unit IV(English)Newton's Methods Roots of second degree Polynomials. Interpolation : Lagrance interpolation, Divided differences, Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Newton's Methods Roots of second degree Polynomials. Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Newton's Methods Roots of second degree Polynomials. Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Newton's Methods Roots of second degree Polynomials. Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Newton's Methods Roots of second degree Polynomials. Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Iehdj.kksa ds gy & f}&fOHkktu fof/k] jsX;wyk QkYlh fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds ewyA vUrZos'ku & ySxzkat vUrZos'ku lw= la[;kRed (ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=A} <td></td> <td></td> <td>ykafcdrk izØeA</td> <td></td>			ykafcdrk izØeA	
Unit IV(English)Interpolation : Lagrance interpolation, Divided differences, Interpolation formula using Differences, Numerical Quadrature, Newtorn - Cote's formulae, Gauss Quadrature formulae.Image: Regular to the second			Solution of Equations : Bisection, Secant, Regula Falsi,	
Unit V       Interpolation formula using Differences, Numerical Quadrature, Newtorn – Cote's formulae, Gauss Quadrature formulae.         1       Iehdj.kksa ds gy & f}&foHkktu fof/k] jsX;wyk QkYlh fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed {ks=dyu U;qVu dksV~I lw=] xkml {ks=dyu lw=A         Itenear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods).         Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			Newton's Methods Roots of second degree Polynomials.	
Newtorn - Cote's formulae, Gauss Quadrature formulae.Newtorn - Cote's formulae, Gauss Quadrature formulae.Iehdj.kksa ds gy & f}&foHkktu fof/k] jsX;wyk QkYlhfof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k dsewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr'xarj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed{ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=ALinear equations direct methods for solving systems of linearequations (Gauss elimination, I.U. decomposition, Choleskydecomposition). Iterative methods (Jacobi, Gauss - Seidalreduction methods).Ordinary differential equations : Euler method, Single sepmethod, Runge-Kutta's method, Multistep methods, MilneSimpson method, Methods based on Numercal integration,	Unit IV	(English)	Interpolation : Lagrance interpolation, Divided differences,	
Unit VIehdj.kksa ds gy & f}&foHkktu fof/k] jsX;wyk QkYlh fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed {ks=dyu U;qVu dksV~I lw=] xkml {ks=dyu lw=A}Unit VImage: Composition of the			Interpolation formula using Differences, Numerical Quadrature,	
Unit V(English)fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed {ks=dyu U;qVu dksV~I lw=] xkml {ks=dyu lw=A}Unit VLinear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			Newtorn – Cote's formulae, Gauss Quadrature formulae.	
VáfgUnh ½ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed {ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=ALinear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			lehdj.kksa ds gy & f}&foHkktu fof/k] jsX;wyk QkYlh	
1/2ewyA vorzos ku & yszzkat vorzos kuj for kkttr varj] varj ds mi;ksx ls vUrZos ku lw= la[;kRed {ks=dyu U;qVu dksV~I lw=] xkml {ks=dyu lw=AUnit VLinear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds	
Unit V(English)Varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed [ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=AUnit VLinear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,		-	ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr	
Unit V(English)Linear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods).Unit V(English)(English)Unit V(English)Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,		72	varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed	
Unit V(English)(English)equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			{ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=A	
Unit V(English)decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			Linear equations direct methods for solving systems of linear	
Unit V (English) reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			equations (Gauss elimination, I.U. decomposition, Cholesky	
Unit V (English) Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,	1			
Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration,			decomposition). Iterative methods (Jacobi, Gauss - Seidal	
Simpson method, Methods based on Numercal integration,		(English)		
	Unit V	(English)	reduction methods).	
methods based on numerical differentiation.	Unit V	(English)	reduction methods). Ordinary differential equations : Euler method, Single sep	
	Unit V	(English)	reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne	

	jSf[kd lehjd.k] jSf[kd lehdj.kkas ds fudk; dks gy
	djus dh izR;{k fof/k;k% ¼xkml foyksiu] ,y&;w
¼fgUnh	fo;kstu] pksysLdh fo;kstu½' iqujko`Ùkh fof/k;k;
1/2	1/4tdkch fof/k] xkml flMsy fof/k1/2] lk/kkj.k vody
	lehdj.k vk;yj fof/k] ,dy pj.k fof/k] :ax dqV~Vk fof/k]
	cgqpj.k fof/k] feyus&flEilu fof/k] la[;kRed lekdyu ij

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(As Recommended by the Board of Studies)

#### Session: 2019-20

vk/kkfjr fof/k;ki ,oa la[;kRed vodyu ij vk/kkfjr	
fof/k;k¡A	

#### Text Books

- 1. K.B. Datta Matrix and Linear Algebra, Practice hall of India Pvt. Ltd, New Delhi, 2000.
- 2. S.S. Sastry Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

#### Reference Books :

- 1. K. Hoffman and R. Kunze Linear Algebra, 2<sup>nd</sup> Edition, Prentice Hall Englewood Cliffs New Jersey, 1971.
- 2. S.K. Jain. A Gunawardena & P.B. Bhattacharya Basic Linear Algebra with MATLAB Key College Publishing (Springer Verlag) 2001.
- 3. S, Kumarsaran Linear Alebra, A Bermetric Approac Prentice Hall of India, 2000.
- 4. Balaguruswamy Numerical methods, Tata Mc Graw Hill Publications, New York.

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(As Recommended by the Board of Studies) Session: 2019-20 Theory

Class		B.Sc. / B.A. III Year			
Subject	(English)	Mathematics		Dener	
Subject	¼fgUnh½	xf.kr		Paper No.: II	
Title of	(English)	Real and Complex Analysis			
the paper	¼fgUnh½	okLrfod ,oa lfEeJ	fo'kys"k.	k	
Compulsory Paper		Medium of Teaching : Hi	ndi, English		
Maximum Marks		Total : 50	Main Exar	n:	C.C.E.:

Unit		Syllabus	Recommended Books
	(English)	Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables, Schwartz's and Young's theorem, Implicit function theorem.	
Unit I	¼fgUnh ½	jheku lekdy] Irr ,oa ,dfn"V Qyuksa dh lekdyuh;rk] lekdyu dk ewyHkwr izes;] lekdyuksa ds ek/;eku izes;] nks pjksa ds okLrfod eku Qyuksa ds vkaf'kd vodyt ,oa vydyuh;rk] LoktZ ,oa ;ax ds izes;] vLi"V Qyu izes;A	
	(English)	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullanl's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.	
Unit II	¼fgUnh ½	vuqfpr lekdy ,oa mudk vfHklj.k rqyuk ijh{k.k vkcsy ,oa fMfjDys dk ijh{k.k] izpkfyd Qyuksa ds :i esa Ýqykuh lekdy] lkarR;] ,d izkpy ds Qyu ds lekdy vodyuh;rk ,oa lekdyuh;rk v)Z ,oa iw.kZ varjkyksa dh Qksfj;j Js.khA	

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## Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies) Session: 2019-20

		Definition and examples of metric spaces, Neighbourhoods,	
		Limit points, interior points, Open and closed sets. Closure and	
		interior, Boundary points, Subspace of metric space, Cauchy	
	(English)	sequences, Completeness, Cantor's intersection theorem,	
		Contraction principle, Real number as a complete ordered field.	
		Dense subsets Baire Category theorem, Separable, second	
		countable and first countable spaces.	
Unit III		nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehl;] lhek	
		fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd	
		,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V]	
	¼fgUnh ½	dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;]	
	72	ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod	
		la[;k;sa] la?ku mileqPp; ck;j&dsVsxjh izes;]	
		i`FkDdj.k] f}rh; x.kuh; ,oa izFke x.kuh; lef"VA	
		Continuous functions, Extension theorem, Uniform continuity,	
	(English)	Compacteness, Sequential compactness. Totally bounded	
Unit IV		spaces. Finite intersection property, Continuous functions and	
		compact sets. Connectedness.	
		Irr Qyu] foLrkj izes;] ,dleku IkarR;] lagrrk]	
	¼fgUnh	vuqØe.kh; lgrrk iw.kZ ifjc) lfef"V] ifjfer loZfu"B	
	1/2	izxq.k] larr Qyu ,oa lagr leqPp;] lac)rkA	
		Complex numbers as ordered pairs, Geometric representation of	
		complex numbers. Continuity and differentiability of compex	
	(English)	function. Analytic functions, Cauchy-Reimann equations.	
Unit V		Harmonic functionsMobius transformations. Fixed points, Cross	
Unit V		ratio. Inverse points. Conformal Mappings.	
	¼fgUnh	IfEeJ la[;k Øfer ;qXe ds :i esa IfEeJ la[;k dk	
	1/2	T;kfefr; fu:i.k] lfEeJ] Qyuksa dh lkrR;rk vkSj	

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(As Recommended by the Board of Studies)

Session: 2019-20

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	izlaoknh Qyu] eksfc;l :ikarj.k] fLFkj fcUnq fr;Zd	
	vuqikr] izfrykse fcUnq] dkWuQkeZy QyuA	

#### Text Books

- 1. Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi
- G.J. Simmons Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963
- 3. L.V. Alhfors, complex analysis Mc Graw Hill, New York

## 4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

#### Reference Books :

- 1. Water Rudin Real and Complex Analysis Mc Graw Hill, New York.
- 2. Ponnusway Complex Analysis, Narosa Publication, New Delhi.
- 3. R.V. Churchill & J.W. Brown, Complex Variables and Application, 5<sup>th</sup> Edition, Mc Graw Hill, New York, 1990.

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## Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies) Session: 2019-20

# Theory

Class		B.Sc. / B.A. III	Year		
Cubicot	(English)	Mathematics	Don	Paper No.: III	
Subject	¼fgUnh½	xf.kr Paper NC		er no.: m	
Title of (English)		<b>Discrete Mather</b>	natics		
the paper	1/4 totoDr xt_kr				
Compulsory Paper		Medium of Teachi	ng : Hindi, English		
Maximum Marks		Total: 50	Main Exam:	C.C.E.:	

Unit		Syllabus	
	(English)	Boolean functions – disjunctive & conjunctive normal forms (canonical & dual canonical), Bools's expansion theorem. Relations – Binary relation, Inverse relation, Composite relation, Equivalence relation, Equivalence classes & its properties Partition of a set.	
Unit I	¼fgUnh ½	cwyh; Qyu & fo;kstuh; ,oa la;kstuh; izlkekU; :i ¼dsuksfudy ,oa Mwvy dsukfudy½] cwy dk foLrkj izes;A laca/k & f}pj laca/k] izfrykse laca/k] la;ksftr laca/k] rqY;rk laca/k] rqY;rk oxZ ,oa mlds xq.k /keZ] leqPp; dk foHkktuA	
Unit II	(English) Partial order relation, Partially ordered sets, totally ordered sets. Hasse diagram, maximal and minimal element first and last element. Lattice – definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.		

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(As Recommended by the Board of Studies) Session: 2019-20

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1⁄2	izFke ,oa vfUre vo;o] tkyd & ifjHkk"kk ,oa mnkgj.k]	
	}Sr tkyd] ifjc) tkyd] forj.kh; tkyd] iwjd tkydA	

		Graph – Definition types of graphs, Subgraphs, walk-path,	
	/ <b>_</b>	circuit, connected and disconnected graphs. Euler graph.	
	(English)	Hamiltonian path and circuit, shortest path in weighted graph.	
		Dijkstra's Algorithm for shortest paths.	
Unit III	_	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k] xeu] iFk ,oa	
	¼fgUnh	ifjiFk laca) ,oa vlac) xzkQ vkW;yj xzkQ]	
	1⁄2	gsfeYVksfu;u iFk vkSj ifjiFk] Hkkfjr vkys[k esa	
		y?kqRre iFk gsrq MkWbtdL=k] ,YxksfjFkeA	
		Trees and its properties, Rooted tree, Binary tree, Spanning tree,	
Unit IV	(English)	Rank and nullity of a graph, Kruskal's Algorithm and Prim's	
		Algorithm.	
		o`{k ,oa mlds xq.k /keZ] fu;r o`{k] f}opj o`{k] tud	
	¼fgUnh ½	o`{k] vkys[k dh tkfr ,oa 'kwU;rk] dqLdy ,oa izkbe	
	72	dh ,YxksfjFkeA	
		Matrix representation of graph - Incidnece and Adjacency	
	(English)	matrix. Cutset and its properties. Planar graphs (definition)	
		Kuratowski's two graphs.	
Unit V		vkys[k dk vkO;wg fu:i.k & bUlhMsal ,oa ,MtsUlh	
	¼fgUnh ½	vkO;wg ] dVlsV~l ,oa mlds izxq.k] lykuj vkys[k	
		¼ifjHkk"kk½] dqjkVksOgLdh ds f}vkys[kA	

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## Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal Syllabus for Mathematics (As Recommended by the Board of Studies) Session: 2019-20

#### Text Books

- 1. C.L.Liu Elements of Discrete Mathematics, Mcgraw Hill, New-York
- 2. Narsingh Deo Graph Theroy, Prentice Hall
- 3. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for Mathematics (As recommended by Board of studies) 8 Session:...... 2018-2019. 3 省 膏 -ARISTER PLEASURE OF THE PLEASU (iii) ٢ गेरग्वेदात्मने नग 3 0  $\bigcirc$ B.Sc. I YEAR (2.) 6) () (3) ٢ 0 Signature of members of B.O.S 0 6 0 0 0



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SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.) Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies) Session/ মান্স - 2018-19

## THEORY

Class		B.Sc.	1 <sup>st</sup> Year
Subject		Mathematics	
Title of the Pape	r	Algebra and Trigonometry बीजगणित एवं त्रिकोणमिति	Paper No. First/प्रथम
Medium of (Teaching)	instructions	English/Hindi अंग्रेजी / हिन्दी	Question Paper Language: English/Hindi अंग्रेजी / हिन्दी
Maximum Mark	S	Total: 50	*3 63 * K
			ctors. Linear Independence of
		जाति, आव्यूह का प्रासामान्य ए समीकरण, आयगेन मान, आयगेन	
application homogenous		nilton theorem and its use in of matrix to solve a system of l e) equations, theorems on consis near equations, solving linear equa	inear (homogenous and non- tency and inconsistency of a
इकाई2	ज्ञात करने में आव्यूह का प्र	ल्टन प्रमेय एवं आव्यूह का व्युत्क्रम ों इसका उपयोग, रैखिक समीकरण ायोग, रैखिक समीकरणों के निकाय ज्ञात राशियों तक के रैखिक समीकर	ों के निकाय के हल के लिये की संगतता एवं असंगतता पर
Unit - 3	Relation between the roots and coefficients of a general polynom equation in one variable, transformation of equations. Reciprocal equation Descarte's rule of signs.		uations. Reciprocal equations
इकाई–3	एक चर के समीकरणों क	सामान्य बहुपदों के समीकरण के ग ा रूपांतरण, व्युत्क्रम समीकरण, चिन्ह	रणांकों एवं मूलों के बीच संबंध ों का दिकार्ते नियम।

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Unit - 4	Logic - Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalence, Algebra of propositions. Boolean Algebra-definition and properties, switching circuits and its applications, logic gates and circuits.
इकाई—4	तर्कशास्त्र – तर्क संयोजक, सत्यता सारणी, पुनरूक्ति और व्याघात, तार्किक तुल्यता, साध्यों का बीजगणित। बूलीय बीजगणित – परिभाषा एवं उसके गुणधर्भ। रिवचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ।
Unit - 5	De- Moivre's theorem and its application, direct and inverse circular and hyperbolic functions. expansion of trignometric functions, Logarithm of complex quantities. Gregory's series, summation of trignometrical series.
इकाई—5	डी — मोइवर्स प्रमेय एवं इसके अनुप्रयोग प्रत्यक्ष एवं व्युत्क्रम वृत्तीय एवं अतिपरवलयिक फलन। त्रिकोणमितीय फलनों का विस्तार, सम्मिश्र संख्याओं का लघुगणक, ग्रीगोरी श्रेणी, त्रिकोणमितीय श्रेणियों का योग।

#### **Text Books:**

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- 1. S.I. Loney Plane Trigonometry Part- II
- 2. K.B. Datta Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
- 3. Chandrika Prasad A Text Book on Algebra and Theory of Equations, Pothishala Pvt.Ltd., Allahabad.
- 4. C.L. Liu Elements of Discrete Mathematics (Second Edition). MeGraw Hill, International Edition, Computer Science Series, 1986.
- 5. मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें।

#### **Reference Books:**

- 1. H.S. Hall and S.R. Knight Higher Algebra H.M. Publication, 1994.
- 2. N. Jacobson Basic Algebra Vol. I and II, W.H. Freeman.
- 3. I.S. Luther and I.B.S. Passi Algebra Vol I and II, Narosa Publishing House.
- 4. N.Saran and R.S. Gupta Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad.

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# SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.) Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies)

Session/ 저죄 - 2018-19

# THEORY

Class		B.Sc.	1 <sup>st</sup> Year
Subject		Mathematics	
Title of the Paper	r	Calculus and Differential	Paper No. Second/द्वितीय
<u>.</u>		Equations	
		कलन एवं अवकल समीकरण	
Medium of	instructions	English/Hindi	Question Paper Language:
(Teaching)		अंग्रेजी / हिन्दी	English/Hindi अंग्रेजी / हिन्दी
Maximum Marks	S	Total: <b>50</b>	
Unit - 1		lifferentiation, Leibnitz theorem, N	Iaclaurin's and Taylor's series
	expansions,	Asymptotes.	525 J
इकाई—1	उत्तरोत्तर अ	वकलन, लैबनीज प्रमेय, मॅक्लारिन	एवं टेलर श्रेणी में विस्तार।
	अनंतस्पर्शी।		
Unit - 2	Curvature, to	ests for concavity and convexity,	points of inflexion, multiple
		ig of curves in Cartesian and polar	
इकाई–2	वक्रता, उत्तलता एवं अवतलता का परीक्षण, नति परितर्वन बिन्दु, बहुबिन्दु, कार्तीय		
		र्देशांकों में वक्रों का अनुरेखण।	3' 3' 3'
	,		
Unit - 3	Integration of transcendental functions, Definite Integrals, Reduction		
Ont 5		adrature, Rectification.	ernine integrais, recurrigin
इकाई–3	अबीजीय फलों का असमकलन, निश्चित समाकलन, समानयन सूत्र, क्षेत्रकलन एवं		
K TAK U	चापकलन ।		
	91 197011	N	
Linit 4	Tingon diffe	montial aquations and aquations	aduaible to the linear form
Unit - 4		rential equations and equations in the second secon	
		rential equations, First order and	
	solvable IO	r x.y and p, Clairaut's equati	ion and singular solutions,



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geometrical meaning of a differential equation, Orthogonal trajectories.

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इकाई–4	रैखिक अवकल समीकरण एवं रैखिक समीकरण में समानेंय अवकल समीकरण, यथातथ अवकल समीकरण, x, y और b में हल होने योग्य प्रथम कोटि एव उच्च धातीय अवकल समीकरण, क्लेरो का समीकरण और विचित्र हल। अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदियाँ।
Unit - 5	Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations. Linear differential equations of second order, transformation of equations by changing the dependent variable independent variable method of variation of parameters.
इकाई–5	अचर गुणांकों वाले रैखिक अवकल समीकरण, साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण, स्वतंत्र चर/परतंत्र चर के परिवर्तन द्वारा समीकरणों का रूपांतरण, प्राचल विचरण विधि।

#### **Text Books:**

- Gorakh Prasad Differential Calculus, Pothishala Private Ltd., Allahabad. 1.
- Gorakh Prasad Integral Calculus, Pothishala Private Ltd., Allahabad. 2.
- D.A. Murray, Introductory Course in Differential equations, Orient Longman (Indian), 3. 1967.
- मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें। 4.

#### **Reference Books:**

- G.F. Simmons Differential equations, Tata McGraw Hill, 1972. 1.
- E.A. Codington An Introduction to ordinary differential equation, Prentice Hall of 2. Indian, 1961.
- H.T.H. Piaggio- Elementary Treatise on Differential Equations and their Application, 3. C.B.S. Publisher & Distributors, New Delhi 1985.
- S.G. Deo- Differential Equations, Narosa Publishing House. 4.
- N.Piskunov Differential and Integral Calculus, Peace Publishers, Moscow. 5.

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## SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.) Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies) Session/ 국저 - 2018-19

## **THEORY**

Class		B.Sc.	1 <sup>st</sup> Year
Subject		Mathematics	
Title of the Paper		Vector Analysis and Geometry सदिश विश्लेषण एवं ज्यामिति Paper No. Third/तृत	
Medium of instructions (Teaching)		English/Hindi अंग्रेजी / हिन्दी	Question Paper Language: English/Hindi अंग्रेजी/हिन्दी
Maximum Marl	KS	Total: 50	S. Land
Unit - 1 इकाई—1	Reciproca	d vector product of three vecto l vectors, vector differentiation. Gra	dient, Divergence and curl.
รุษารุ—า	तीन सदिशों का अदिश एवं सदिश गुणन, चार सदिशों का गुणन, व्युत्क्रम सदिश सदिश अवकलन, ग्रेडियंट, डायवरजेन्स एवं कर्ल।		
Unit - 2	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them.		
इकाई—2	सदिश समाकलन, गॉस, ग्रीन एवं स्टोककी प्रमेय (बिना उपपत्ति) एवं इन पर आधारित प्रश्न।		
Unit - 3	General equation of second degree, tracing of conics, system of conies polar equation of conic.		
इकाई—3	द्वितीय घात के व्यापक समीकरण, शांकवो का अनुरेखण, शांकव निकाय, शांकव का धुव्रीय समीकरण।		
Unit - 4	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators. Right circular cone, Equation of cylinder and its properties.		
इकाई—4		आधार पर शंकु का समीकरण, शंकु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का र	

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Unit ·	- 5 Central conicoids, Paraboloids, plane sections of conicoids, Generating lines.
इकाई	
Toyt	Books:
1.	N. Saran and S.N. Nigam - Introduction to Vector Analysis Pothishala Pvt.Ltc Allahabad.
2.	Gorakh Prasad and H.C. Gupta- Text Book on Coordinate Geometry, Pothishala Priva Ltd., Allahabad.
3.	N.Saran and R.S. Gupta - Analytical Geometry of Three Dimension. Pothishala Pvt.Lto Allahabad (unit IV).
4.	मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें।
Refe	rence Books:
1.	R.J.T. Bell - Elementary Treatise on Coordinate Geometry of Three Dimension Macmillan India Ltd., 1994 (Unit-V).
2.	Murray R. Spiegel - Theory and Problems of Advance Calculus Sehaum Publishin Company, New Yark.
3.	Murray R. Spiegel - Vector Analysis, Sehaum Publishing Company, New Yark.
4.	Shanti Narayan - A Text Book of Vector Calculus, S.Chand & Co., New Delhi.
5. 6.	Shanti Narayan - A Text Book of Vector Algebra, S.Chand & Co., New Delhi. S.L. Loney - The Elements of Coordinate Geometry, Macmillan and Company, London.
0. 7.	P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Two Dimension Macmillan Indian Ltd., 1994.
8.	P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Thro Dimensions, Willey Eastern Ltd., 1999.

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## Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:.....2016-2017.

सत्र / Session : 2018-19

Max. Marks/अधिकतम अंक	÷	50 (
Class/कक्षा	* 1	B.Sc./B.A.
Year, वर्ष	•	Second / द्वितीय
Subject/विषय	8 9	Mathematics/गणित
Paper / प्रश्नपत्र	4	First/प्रथम
Title/शीर्षक	1	Abstract Algebra
		अमूर्त बीजगणित

Unit-1	Definition and basic properties of groups, subgroups, subgroups generated by a
	subset, Cyclic groups and simple properties.
ईकाई–1	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय
	समूह एवं सामान्य प्रगुण
Unit-2	.Coset decomposition. Lagrange's theorem and its corollaries including Fermat's
	theorem, Normal subgroups. Quotient groups.
ईकाई2	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय फर्मा प्रभेय, प्रसामान्य उपसमूह,
1	विभाग समूह।
Unit-3	Homomorphism and Isomorphism of groups. Fundamental theorem of
	homomorphism. Transformation and Permutation group, S <sub>n</sub> (various subgroups
	of $S_n$ , n<5 to be studied). Cayley's theorem.
ईकाई–3	समूहों की समाकारिता एवं तुल्याकारिता, समाकारिता का मूलभूत प्रमय, रुपान्तरण एवं
	क्रमचय समूह Sn(Sn के विभिन्न उपसमूह, संकल्पित है कि n<5). कैली प्रमेय।
Unit-4	Group Automorphism. Inner Automorphism. group of Automorphisms.
1	Conjugacy relation and Centraliser. Normaliser. Counting principle and class
1	equation of a finite group. Cauchy's theorem for finite abelian groups and non-
	abelian groups.
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ईकाई4	। समूह स्वकारिता, अंतः स्वकारिता, स्वकारिताओं का समूह, संयुग्मिता संबंध और ।
	केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित
	आबेली एवं अन–आबेली समूह के लिए कौशी का प्रमेय।
Unit-5	Definition and basic properties of rings, Ring homomorphism subrings, Ideals and Quotient rings, Polynomial rings & its properties, Integral domain and Field.
ईकाई5	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग
	वलय. बहुपद वलय एवं उसके प्रगुण. पूर्णाकीय प्रांत एवं क्षेत्र।)

#### **Text Books:**

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- 1. I. N. Herstein-Topics in Algebra. Wiley Eastern Ltd. New Delhi. 1977.
- 2. PB Bhattacharya, S. K. Jain and S R Nagpaul-Basic Abstract Algebra. Wiley Eastern, New Delhi, 1997
- 3. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books:**

Shantinarayan-A text Book of Modern Abstract Algebra, S.Chand and Company, New 1. Delhi.

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- Surject Singh- A Text Book of Modern Algebra. 2.
- 3. N. Jacobson- Basic Algebra, Vol. I and II, W. H. Freeman.
- 4. I. S. Luther and I. B. S. Passi- Algebra., Vol I and II, Narosa Publishing House.

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#### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:......2018-2019.

Max. Marks/अधिकतम अंक	Ĭ	50
Class/কঞ্চা	¢	B.Sc./B.A.
Year/वर्ष		Second/ द्वितीय
Subject/विषय	ţ	Mathematics/गणित
Paper / प्रश्नपत्र	Š.	Second/द्वितीय
Title/शीर्षक		Advanced calculus
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Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic Unit-1 sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test, Cauchy's intergral test, Cauchy's root test, ratio tests, Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence. अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमय, परिबद्ध एवं एकदिष्ट अनुक्रम कॉशी का ईकाई-1 अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉशी का समाकल परीक्षण, कॉशी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण। Continuity of functions of single variable, sequential continuity. Properties of Unit-2 continuous functions. Uniform continuity, chain rule of differentiability. Mean value Darboux's intermediate value theorems and their geometrical interpretations. theorem for derivatives. सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, ईकाई-2 अवकलनीयता का श्रंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामीतीय अर्थ, अवकलों के लिए डार्ब का मध्यवर्ती मान प्रमेय। Limit and continuity of functions of two variables. Partial differentiation, Change of Unit-3 variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians.

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दो चरों के फलनों की सीमा एवं सांतत्य, आंशिक अवकलन, चरों का परिवर्तन, समघात
फलनों पर आयलर का प्रमेय, दो चरों के फलनों के लिए टेलर का प्रमेय, जेकोबियन।
Envelopes, Evolutes. Maxima and Minima of functions of two variables. Lagrange's
multiplier method. Beta and Gamma Functions.
अन्वालोर्प, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लेग्रांज के गुणांको की विधि,
बीटा एवं गामा फलन।
Double and triple integrals, volumes and surfaces of solids of revolution Dirichlet's
integrals, change of order of integration in double integrals.
द्विक एवं त्रि–समाकल, ठोस के परिभ्रमण से जनित आयतन एवं प्रष्ठ, ड्रीचलेटस् समाकल,
द्विक समाकल के क्रम का परिवर्तन।

**Text Books:** 

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- 1. R. R. Goldbeg -Real Analysis, Oxford& I.B.H. Publishing co., New Delhi
- 2. Gorakh Prasad- Differential Calculus. Pothishala Pvt. Ltd. Allahabad.
- 3. Gorakh Prasad- Integral Calculus, Pothishala Pvt. Ltd. Allahabad
- 4. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

#### **Reference Books:**

- 1. Gabriel Klaumber- Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975
- 2. T. M. Apostol- Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
- 3. D. Soma Sundaram and B. Choudhary- A first Course in mathematical Analysis, Narosa Publishing, House, New Delhi, 1997.
- 4. Murray R. Spiegel- Theory and problems of advance Calculus. Schauma Publishing Co., New York
- 5. O. E. Stanaitis- An Introduction to Sequences, Series and improper Integrals.

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# SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.) Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies)

Session/ सत्र - 2018-19

Max. Marks/अधिकतम अंक	8	50
Class/कक्षा	1	B.Sc./B.A.
Yearःवर्ष	2 1	Second / द्वितीय
Subject/विषय	97 B)	Mathematics, गणित
Paper / प्रश्नपत्र		Third/तृतीय
Title/शीर्षक	:	Differential Equations
		अवकल समीकरण

Unit-1	Series solutions of differential equations. Power series method, Bessel and Legendre
	equations, Bessel's and Legendre's functions and their properties- recurrence and
	generating function. Orthogonality of functions.
ईकाई—1	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं
	लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।
Unit-2	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem
	for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting
	theorems, Differentiation and integration of transforms.
ईकाई–2	लॉप्लास रुपांतरण, लॉप्लास रुपांतरण की रैखिकता, लॉप्लास रुपांतरण के लिए अस्तित्व
	प्रमेय। अवकलजों एवं समाकलों का लॉप्लास रुपांतरण, रथनांतर प्रमेथ, रुपातरणों का
	अवकलन एवं समाकलन।
Unit-3	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving linear differential equations with constant coefficients.
ईकाई–3	प्रतिलोम लॉप्लास रुपांतरण, संवलन प्रमेय, अचर गुणांको वाले रैखिक अवकल समीकरणों को
	हल करने में लॉप्लास रुपांतरणों के अनुप्रयोग।
Unit-4	Partial differential equations of the first order. Lagrange's solution. Some special
	types of equations which can be solved easily by methods other than the general
Ĺ	method, Charpit's general method.

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ईकाई-4	प्रथम कोटि के आंशिक अवकल समीकरण, लैग्रांज विधि, विशिष्ट प्रकार के अवकल समीकरण
	का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरलता से हल, चारपिट की व्यापक विधि।
Unit-5	Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to
	equations with constant coefficients.
ईकाई—5	द्वितीय व उच्च कोटि के आंशिक अवकल समीकरण, द्वितीय कोटि के आंशिक अवकल
	समीकरणों का वर्गीकरण. अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों
	में समानेय आंशिक अवकल समीकरण।

#### Text Book:

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- 1. Sharma and Gupta- Integral Transform, Pragati, Prakashan Meerut.
- 2. Sharma and Gupta- Differential Equation, Pragati, Prakashan Meerut.
- 3. Raysinghania- Differential Equation, S. Chand & Company, New Delhi.
- 4. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Book

- 1. D. A. Murray Introductory course in differential equation. Orient Longman, India, 1967
- 2. G. F. Simnons Differntial Equations, Tata Mcgraw Hill, 1972.
- E.A. Codington An introduction to Ordinary differential equations. Prentice Hall of India, 1961
- 4. H. T. H. Piaggio Elementary Treatise on Differential equations and their applications.
   C. B. S. Publisher and Distributors, Delhi, 1985.
- 5. E. D. Rainville Special Functions, The Macmillan Company, New York.

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## Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics*

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(As recommended by Board of studies)

# Theory

Class		B.Sc./B.A.	Semester: V
	(English)	) Mathematics	Depar Ma + I
Subject	हिन्दी	गणित	Paper No.: I
	(English)	) Linear Algebra, Numer	ical Analysis
Title of the pape	r हिन्दी	रैखीय बीजगणित, संख्या	त्मक विश्लेषण
Medium of instructions (Teaching)		Both English & हिन्दी	Question Paper Language: Both हिन्दी & English
Maximum Marks	<b>Total : 150</b>	Main Exam :100	C.C.E : 50
Un	hit	Syl	llabus
		Linear span, Linear dep	
Unit I	(English)		perties. Basis, Finite s. Existence theorem for number of elements of a

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		अस्तित्व प्रमेय, आधार समुच्चय में अवयवों की संख्या
		की अपरिर्वतनशीलता, विमा, सदिश उपसमष्टियों के
		योग की विमा ।
		*
		Linear transformations and their representation as
		matrices. The algebra of linear transformations.
	(English)	The rank - nullity theorem, Eigen values and eigen
	(English)	vectors of a liner transformation, Diagonalisation,
		Quotient space and its dimension.
		रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक
Unit II	हिन्दी	
		रूपांतरणों का बीज गणित, जाति शून्यता प्रमेय, रैखिक
		रूपांतरणों के आयगन मान एवं आयगन सदिश
		विकर्णीकरण, विभाग समष्टि एवं उसकी विमा।
		Approximations, Errors and its types, Solution of
		Equations: Bisection, Secent, Regula Falsi,
		Newton-Raphson Method and their order of
		convergence, roots of second degree Polynomials,
Unit III	(English)	Interpolation: Lagrange interpolation, Divided
		Differences, Interpolation formulae using
		Differences and derivations of Interpolation
		formula.
	0.0	सन्निकटन, त्रुटियां एवं उसके प्रकार, समीकरणों के
हिन्दी	हिन्दी	हल द्विभाजन, सीकेन्ट, रेग्युला फाल्सी तथा

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		न्युटन–रॉप्सन विधि एवं उसकी अर्भिबेन्दुता की कोटि, द्वितीय घात बहुपदों के मूल। अर्न्तवशनः लग्रांजे अर्न्तवशन, विभाजित अंतर, अंतर के उपयोग से अर्न्तवशन सूत्र एवं अर्न्तवशन सूत्रों की उत्पत्ति।
	(English)	Linear Equations : Direct Methods for Solving Systems of Linear Equations, Gauss elimination, Gauss Jordan Method, LU Decomposition, Cholesky Decomposition, Iterative Methods: Jacobi Method, Gauss - Seidel Method, Relaxation Method, Methods Based on Numerical Differentiation.
Unit IV	हिन्दी	रैखिकसमीकरण ः रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियां, गाउस विलोपन, गाउस जार्डन विधि, एल यू वियोजन, चोलेस्की वियोजन;, पुनरावृत्ति विधियां, जेकोबी विधि, गाउस सिडेल विधि, रिलेक्सेशन विधि, संख्यात्मक अवकलन पर आधारित विधियां।
Unit V	(English)	Ordinary Differential Equations: Euler Method, Eulers Modified Method, Single-step Methods Runge-Kutta's Method, Multi-step Methods, Milne Method, Numerical Quadrature, Newton-Cote's
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		Formulae, Gauss Quadrature Formulae, Methods Based on Numerical Integration with their derivation.
	हिन्दी	साधारण अवकल समीकरण आयलर विधि, आलर संशोधित विधि, एकल चरण विधि, रूंगकुटटा विधि, बहुचरण विधि, मिलने विधि, संख्यात्मक क्षेत्रकलन, न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र, संख्यात्मक समाकलन पर आधारित विधियां एवं उनकी उत्पत्ति।
Recommended Books	(English)	<ol> <li>K. Hofman and R.Kunze, Linear Algebra, 2nd Edition, Prentice Hall Englewood Cliffs, New Jersey 1971.</li> <li>C.E. Frooerg. Introduction to Numerical Analysis(Second Edition L Addison-Wesley- 1979.</li> <li>M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods Probles and Solutions, New Age International (P) Ltd, 1996.</li> </ol>
Reference Book		<ol> <li>E. Balaguruswamy - Numerical Method Tata Mc</li> <li>Graw_ Hill Pub. Com - New Yark</li> <li>K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd, New Delhi, 2000</li> </ol>
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*		<ol> <li>S.K. Jain, A Gunawardena &amp; P.B.</li> <li>Bhattacharya, Basic Linear Algebra with MATLAB Key college Publishing (Springer-Verlag) 2001.</li> <li>S.Kumarsaran, Linear Algebra A Geometric Approach Prentice _ Hall of India) 2000.</li> </ol>
	हिन्दी	म.प्र.हिन्दी ग्रंथ अकादमी की पुस्तकें।

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## Theory

Class			B.Sc./B.A.		Semester: VI	
Subject		(English)		Mathematics		Paper No.: I
		हिन्दी		गणित		
Title of the paper (English) हिन्दी Medium of instructions (Teaching)				Real Analysis, Discrete M statistics.	Mathe	matics and
				वास्तविक विश्लेषण, विविक्त गणित एवं सांख्यिकी		
			Both English & हिन्दी Question Paper Language: Both & English		uage: Both हिन्दी	
Maximum Mark	S	Total : 150	)	Main Exam :100	C.C.I	E : 50
Ui	nit			Syllabus		
Unit I		English)	mo int	nctions, Integrability onotonic functions, The fu egral calculus, Mean velu Iculus.	undam	
		गपि हिन्दी सम		ोमान समाकल, रीमान समाकलनीय फलनों का बीज णित, सतत एवं एकदिष्ट फलनों की समाकलनीयता, ामाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान मेय		
Unit II	(	English)	Ne	efinition and examples eighborhoods, Limit points nd closed sets, Closure an	s, Inte	

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Unit III

points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Definition of Continuous functions and its illustrations.

दूरीक समष्टि की परिभाषा एवं उदाहरण सामीप्य, सीमा बिन्दु, अंतः बिन्दु, विवृत्त एवं संवृत समुच्चय, संवरणक एवं अभ्यंतर, परिसीमा बिन्दु, दूरीक समष्टि की उप समष्टि, कौशी अनुक्रम, पूर्णता, केन्टर का सर्वनिष्ठ प्रमेय, संकुचन सिद्धांत, पूर्ण क्रमित क्षेत्र के रूप् में वास्तविक संख्यायें सतत फलन की परिभाषा एवं उसके उदाहरण।

Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of propositions, Quantifiers: Universal and Existential Quantifiers, Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.

तर्क का बीज गणित, पुनरूक्तियों का विरोध का पुनरावलोकन, तार्किक तुल्यता, साध्यों का बीजगणित, प्रमात्रीकारकः आस्तित्व प्रमात्रीकारक एवं सर्व प्रमात्रीकारक, बुलय बीजगणित एवं उसके गुणधर्म,

डी—मार्गन नियम, वैद्युत परिपथों का बीजगणित एवं उनके अनुप्रयोग।

Signature of members of B.O.S

हिन्दी

(English)

हिन्दी

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for <i>Mathematics</i> (As recommended by Board of studies) Session:		
	(English)	Boolean Function, Disjunction and Conjunction Normal Forms, Bools Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial order Relation.
Unit IV	हिन्दी	बूलीय फलन वियोजनीय एवं संयोजनीय प्रसामान्य रूप, बूल का प्रसार प्रमेय द्विचर संबंध, तुल्यता संबंध विभाजन एवं आंशिक क्रम संबंध।
Unit V	(English)	Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation , expectation of sum and product of random variables, Moment generating function , Theoretical distribution: Binomial, Poisson distributions and their properties and uses.
	हिन्दी	प्रायिकता, सतत प्रायिकता, प्रायिकता घनत्व फलन तथा उनके अनुपयोग (सतत प्रायिकता बंटन के लिये माध्य, बहुलक, माध्यिका तथा मानक विचलन ज्ञात करने के लिये) गणितीय प्रत्याशा, यादृच्छिक चरों के योग एवं गुणन की प्रत्याशा, आघूर्ण जनक फलन, सैद्धांतिक बंटनः द्विपद पॉयजन बंटन तथा उसके
Signature o	f members of	B/W 3-18 122118 11/20

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Recommended Books	(English)	गुणधर्म एवं उपयोग। 1. R.R. Gpldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970. 2. G.F. Simmons. Introduction to Topology and Modem Analysis, McGraw-Hill, 1963. 3. T.M. Apostol, Mathematical Analysis, Norosa Publishing House. New Delhi, 1 4. C.L. Liu., Elements of Discrete Mathematics (Second Edition), McGraw Hill, International Editiojns, Computer Science scries 1986.
		<ol> <li>T.M. Apostol, Mathematical Analysis, Norosa Publishing House, New Delhi, 1985.</li> <li>S.Lang. Undergrauate Anallysis, Springger- Veriag, New York, 1983.</li> <li>D.Somasundaram and B.Choudhary, A first Course in Mathematical Analysis. Narosa Publshing House, New Delhi, 1997.</li> <li>Shanti Narayan, A Course of Mathematical</li> </ol>
Reference Book	×	Analysis. S.Chand & Co. Delhi. 5. R.K.Jain and S.K. Kaushik, An introductions to Real Analysis, S.Chand & Co., 2000.
Signature of	members o	<ul> <li>6. P.K. Jain and K/Ahmed Matric Spaces, Narosa Publishing House New Delhi, 1996.</li> <li>7. S.Lang, Undergraduate Analysis, Ppringer <b>f B.O.S</b></li> </ul>

		N/ 1 1/000
		Verlag, New Youk 1983.
		8. E.T. Copson, Metric Spaces, Combridge
		University Press, 1968.
		9. S.Lang. Undergraduate Analysis, Springer-
		Veriag, New Youk 1983.
		1. Statistics by M.Ray.
		2. Mathematical Statistics by J.N.Kapoor,
Elementary		H.C.Saxena (S.Chand)
Statistics		3. Fundamentals of Mathematical Statistics,
		Kapoor and Gupta.
	हिन्दी	म.प्र.हिन्दी ग्रंथ अकादमी की पुस्तकें।

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#### Theory

	Class	M.Sc	/ <b>M.A.</b>	Semester: I		
	Subject	Mathematics				
Title	of the paper	Advanced Ab	stract Algebra-I	Paper	No: I (Compulsory)	
Medium of instructions (Teaching)		English		Quest	ion Paper Language: English	
Maxi	mum Marks	Total 100	Main Exam:	70	C.C.E: 30	
Unit I	Normal & Sub	onormal series of g	groups, Compositi	on series,	Jordan-Holder series.	
Unit II	Solvable & Ni	lpotent groups.				
Unit III			nomials, Algebrai inseparable extens		nscendental extensions	
Unit IV	Perfect fields,	Finite fields, Alge	braically closed fi	elds.		
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.					
Recomme			in Algebra, Wiley			
Book	2. P.B Car		.n. Jain and S.K.	raghani,	Basic Abstract Algebra	

Note : Setting is to be Done Strictly From Recommended Books.

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Theory

Class	<u> </u>	M.S	c / M.A.		Semester:	I
Subject		Mathematics Real Analysis				
Title of the pap	ber			Paper I	No: II (Com	pulsory)
Medium of instructions English (Teaching)		nglish	Question Paper Languag English			
Maximum Mar	rks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Defi proj	nition and ex perties, Integrat	kistence of Riem	ann-Stiel ation.	tjes integral	and its
Unit II	Rea	rrangements of	vector-valued fulter fulter fulter for the sector fuller for the sector for the sector for the sector fuller for the sector	Riemann		
	Seq	uences and s	eries of function	us, pour	WISC MIN	
Unit III	M-t and	est, uniform co	hy criterion for un onvergence and co eltjes integration	ontinuity,	nvergence, W	eierstrass nvergence
Unit III Unit IV	M-t and diff Fur an	est, uniform co Riemann-Sti erentiation.	hy criterion for un onvergence and co eltjes integration al variables, linear R <sup>n</sup> Chain rule, pa	iform continuity, ontinuity, , unifor transfor	nvergence, W uniform co m converge mations, Der	verstrass nvergence ence and ivatives in
	M-t and diff Fur an and Der pov the	est, uniform co Riemann-Sti erentiation. notions of sever- open subset of l inverse function rivatives of hig ver series, Ab orem,	hy criterion for un onvergence and co eltjes integration al variables, linear R <sup>n</sup> Chain rule, pa on theorem. her orders, Power pel's and Tauber	iform con ontinuity, , unifor • transfor rtial deri • series, u *s theore	mations, Der vatives, differ niqueness thems. Implicit	elerstrass nvergence ence and ivatives in rentiation ecorem fo t functio
Unit IV	M-t and diff Fur an and Den pov the	est, uniform co Riemann-Sti erentiation. notions of sever- open subset of l inverse function rivatives of hig ver series, Ab orem,	hy criterion for un onvergence and co eltjes integration al variables, linear R <sup>n</sup> Chain rule, pa on theorem.	iform con ontinuity, , unifor • transfor rtial deri • series, u *s theore	mations, Der vatives, differ niqueness thems. Implicit	eierstrass nvergence ence and ivatives in rentiation eorem fo t functio

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

	Class		M.Sc / M.A.		-	Semester:	1
S	ubject						
Title of the paper Medium of instructions (Teaching)		Тор	ology-I	Paper No : III (Compulsory) Question Paper Language: English		pulsory)	
			English			nguage:	
Maxin	num Ma	rks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	numb theore	ers and it em and th	e continuum hyp	ets. Infinite sets a hroeder-Bernstein oothesis. Zorn's lei ological spaces. Clo	theorem. mma. Wel	Statement of l-ordering the Closure. Dens	Cantor's orem. e subsets
Unit II	Neigh	borhoods	, interior exterio	or and boundary. A paces and relative	Accumula	tion points an	d derived
Unit III	Alteri Opera	nate met ator and P	hods of definin Neighborhood Sy	g a topology in stems. Continuous	terms o s function	f Kuratowski s and homeon	i Closur 10rphism
Unit IV		First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.					
Unit V		Path- connectedness, connected spaces. Connectedness on Real line. Components Locally connected spaces.					
Recommended2.G.FBooksMc			Simmons, In Graw Hill.	ology- A first cours atroduction to T ction to general to	opology a	and Modern	a. Analysi

Note : Setting is to be Done Strictly From Recommended Books.

# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics*

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(As recommended by Board of studies)

#### Theory

Class		M.Sc / M.A.		Semest	er: I		
Subject		Mathematics	Mathematics			6	
Title of the paper Medium of instructions (Teaching)		Complex Ana	lysis-I	Paper No : IV (Compulsory)			
		English		Question Paper Language: English			
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	order derivat	ives	Goursat theorem.				
Unit II	theorem of al	gebra. Taylor's tl					
Unit III	singularities. theorem inve	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche, s theorem inverse function theorem.					
Unit IV	valued functi	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, $\log z$ , $z^a$ .					
Unit V		Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.					
Recomme	nded	3. Conway, Funct					

Note : Setting is to be Done Strictly From Recommended Books

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#### Theory

Class		M.Sc / M.A.		Semest	er: I		
Subject		Mathematics					
Title of the paper Medium of instructions (Teaching)			Advanced Discrete Mathematics-I		√o: V(l) (oµ	otional)	
		English		Questio English	n Paper La	nguage:	
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	groups and r products. Basi	nonoids. Congru ic Homomorphis		d Quotien	t Semi gro	ups. Direct	
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices						
Unit III	irreducible el forms, minim	ements, minterr ization of Boole	gebras as lattices, ns, maxterms, mi ean functions. Ap OR, & NOT gates	interm Boo plications	olean forms of Boolean	s, canonica Algebra to	
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.						
Unit V	& circuits, (	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph					
Recommen	ided 1. J.F	P. Tremblay &	R. Manobar, D	iscrete ma	athematical	Structure	

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.	M.Sc / M.A.		ter: II	
Subject		Mathematics				
Title of the paper Medium of instructions (Teaching)		Advanced Ab	stract Algebra-II	Paper	No : I	
		English		Questi Englis	on Paper La h	nguage:
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Homomorphis	sm, isomorphism	xamples, sub mod I. Finitely generated	l modules	s, cyclic mod	iles.
Unit II			nodules, Free modu			
Unit III	Noetherain & Artin theorem		les and rings, Hilb	ert basis	theorem. W	edderburn
	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.					
Unit IV	structure theo	orem of modules	over a principal ide	eal domai	11.	
Unit IV Unit V	Algebra of lin	ear transformat on , Similarity of	over a principal ide ion,Characterstics f linear transformat	roots , M	atrices , Mat	rix of linea
	Algebra of lin transformatio to triangular	ear transformat n , Similarity of forms. . Bhattacharya,	ion,Characterstics	roots , M tion , inva Nagpaul,	atrices , Mat ariant spaces	rix of linea , Reduction

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# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies)

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#### Theory

Class			M.Sc / M.A.		Semeste	er: II		
Subject			Mathem	atics				
Title of the paper		Lebesque Measure & Integration		Paper No : H				
Medium of (Teaching)	instruct	ions	English			Question Paper Language: English		
Maximum I	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I					asurable sets. Re ity. Non-measural		Measurable	e functions.
Unit II	Riema	ann and L	ebesgu e i	ntegra				
Unit III					ns of Bounded va ntegration.	riation. L	ebesgue Dif	fferentiation
Unit IV	The L <sup>p</sup> -spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L <sup>p</sup> .							
Unit V	Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.							
Recommended Books1. G.D.Barra ,Measure theory and integration .2. Real Analysis by Royden.								

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Theory

lass		M.Sc / M.A.		Semes	ter: II		
Subject		Mathematics	Mathematics				
Title of the	e paper	Topology-II		Paper	No : III		
Medium of instructions (Teaching)		ns English	English Question Paj Eng		on Paper La English	nguage:	
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	Urysoh	ion axioms $T_0, T_1, T_2, T_3$ n's lemma. Tietze extens	sion theorem.				
Unit II	compac	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.					
Unit III	charact Connec	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.					
Unit IV	Compa	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.					
Unit V	fundan	The fundamental group and covering spaces-Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra.					
Recomme Books	ended	<ol> <li>James R. Munkres Pvt. Ltd. New Delh</li> <li>G.F Simmons, In McGraw-Hill Book</li> <li>K.D.Joshi, Introdu</li> </ol>	ii. htroduction to 7 c Company.	Fopology	and Moder	m Analysis,	

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.		Semesto	er: Il		
Subject		Mathematics					
Title of the paper Medium of instructions (Teaching)		Complex Anal	lysis-II	Paper N	lo : IV		
		English		Questio English	n Paper La	nguage:	
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit 1		factorization theo mann's functional		nd its prop	berties. Rie	mann Zeta	
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.						
Unit III		lection principle. I ichlet problem. Gr		n on disc. H	larnack ine	quality and	
Unit IV	of an entire	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.					
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼-theorem.						

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Class			M.Sc / M.A.		Semest	er: Il	
Subject			Mathematics				
Title of the	Sitle of the naner			Advanced Discrete Mathematics-II		Paper No : V(l) (optional)	
Medium of (Teaching)		tions	English		Question Paper Language: English		
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	circu	it matrix	entation of grap , Adjacency ma y search trees.	bhs, incidence mat trix , directed gra	trix Cut set phs definit	t matrix ,pa ion of types	th matrix , of directed
Unit II	,gene	rating fu	numerical functions , Asymptotic behavior of numerical functions g functions , Recurrence relations , linear Recurrence relations with pefficients , homogeneous solution , particular solution , total solution.				
Unit III	deriv	ation, ser	and formal La ntential forms ,I text* Sensitive C	nguages , Langua Language generate Frammars.	iges , phras ed by gram	se structure mar, Regula	Grammars ar, Context-
Unit IV	state	Acceptor	rs ,deterministic	am & Languages and Non-determi Table & Diagram	inistic Finit	e Automata	finite State
Unit V	and 1	Reduced machines, Kleen's Theorem (statement only )Pumping Lemma, Moore and Mealy machines, Turing Machine, Regular Expressions and corresponding Regular Language.( definition only )					
Recommen Books	nded	McGrav	w Hill.	R. Manobar, D y with application			Structures,

Note : Setting is to be Done Strictly From Recommended Books.

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# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies)

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#### Theory

Class			M.Sc / M.A.		Semeste	er: III		
Subject			Mathematics					
Title of the	paper	1	Functional Analysis-I		Paper N	Paper No : I		
Medium of instructions (Teaching)		tions	English		-	Question Paper Language: English		
Maximum	Marks		Total: 100	Main Exam:	70 C.C.E; 30			
Unit I		Normed Linear spaces, Banach Spaces and examples. Properties of normed linea spaces Basic Properties of finite dimensional normed linear spaces.					rmed linear	
Unit II		ned linear subspace, equivalent norms, Ries'z lemma and compactness. ient space of normed linear spaces and its completeness.						
Unit III	Linea	r operator	operator, Bounded linear operator and continuous operators.					
Unit IV	Linea	r function	al, bounded line	ear functional, Du	al spaces w	ith exampl	es.	
Unit V	_		orthogonal c of functional on	omplements, or Hilbert spaces.	thonormal	sets and	sequences.	
Recommended Wiley Books 2. G.		& sons, New Yo	troductions to To					
Reference			Choudhary an cations Wiley Ea		ıdarshan Nanda, Functional Analysis with 1 Ltd.			

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#### Theory

Class		M.Sc / M.A.		Semest	er: III				
Subject		Mathematics							
Title of the paper		Integral Trans	Integral Transform-I Paper No : II		No : II				
Medium o (Teaching)	f instructions )	English	English		Question Paper Language: English				
Maximum	Marks	Total: 100	Main Exam:	70 C.C.E: 30		30			
Unit I Unit II	Shifting theo Application	Laplace Transform, Inverse Laplace Transform. Transforms of derivative Shifting theorem, convolution Theorem. Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.							
Unit III	Laplace Equ to wave equa	ation in two dimen ation.	nsion, Wave Equa	ition in one	e dimension .	Application			
Unit IV	Application	of Laplace Transfo	orm to electrical c	ircuits, Ap	plication to 1	Beams.			
Unit V	Heat conduction.	Heat conduction equation in one dimension, Application to heat conduction equation.							
		Integral Transforn Integral Transforn		Gupta.					

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lass		M.Sc / M.A.		Semest	er: III		
Subject		Mathematics	Mathematics				
Title of the	e paper	Advanced Gr	Advanced Graph Theory-I		Paper No : III		
Medium of instructions (Teaching)		English	English		Question Paper Language: English		
Maximum	Marks	Total: 100	Main Exam:	70 C.C.E: 30		30	
Unit I	Revision of	graph theoretic pro	eliminaries. Isomo	rphism of g	raphs, subg	raphs.	
Unit II	components	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.					
Unit III		erties of trees, Dist ees, Fundamental (					
Unit IV	Cut-sets, Pr and reparat	operties of a cut-s illity.	set, Fundamental	circuits and	d cut-sets,	connectivity	
Unit V		bhs, Kuratowski's action of Planarity,				of a planer	
Recomme Books	nded	Graph theory with by Narsingh Deo. F Graph theory by H	Prentice Hall of Inc	-	and Comp	iter Science	

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#### Theory

Class		M.Sc / M.A.		Semest	er: III		
Subject		Mathematics					
Title of the	paper	Operations R	esearch-I	Paper I	No : IV		
Medium of (Teaching)	instructions	English	English Question Paper La English		on Paper Language: 1		
Maximum	Marks	Total: 100	Main Exam:	70 C.C.E: 30			
Unit I			search and its scope, Origin and Development of Operation acteristics of Operations Research.				
Unit II		Operations Resear of Operation Resea			Research, Uses and Problems.		
Unit III	Mathematic	al Formulation, Gr	aphical Solution I	Method.			
Unit IV	artificial va	al Linear Programming Problem: Simplex Method exceptional cases, ial variable techniques; Big M method, two phase Method and Cyclic ems, problem of degeneracy.					
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Unit V		ndamental properti					
Recommen	ded 1. K		K. Gupta and M				
Recommen	ided 1. K	anti Swarup, PO.	K. Gupta and N ns., New Delhi.				
Recommen	1. K 1. K 1. S.E 2. F.:	Canti Swarup, PO. Sultan Chand & So D. Sharma, Operati S. Hiller and G.J.	K. Gupta and M ns., New Delhi. on Research. Lieberman, Ind	lanmohan ustrial En	, Operations Research		
Recommen	1. K 1. K 1. S.E 2. F.: (This	Canti Swarup, PO. Sultan Chand & So D. Sharma, Operati S. Hiller and G.J. book comes with a	K. Gupta and M ns., New Delhi. on Research. Lieberman, Ind CD containing so	lanmohan ustrial En oftware)	, Operations Research ngineering Series, 1995		
Unit V Recommen Book Reference	1. K 1. K 1. S.D 2. F.3 (This 3. G.1	Canti Swarup, PO. Sultan Chand & So D. Sharma, Operati S. Hiller and G.J. book comes with a Hadley, Linear Pro Hadley, Linear an	K. Gupta and M ns., New Delhi. on Research. Lieberman, Ind CD containing so gramming, Naros	Ianmohan ustrial En oftware) a Publishi	, Operations Research ngineering Series, 1995		

- 5. H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York.
- 6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi

7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

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# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies)

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#### Theory

Class			M.Sc / M.A.		Semeste	er: III
Subject			Mathematics			
Title of the	paper		Theory of Linear Operators-I       Paper No : V(l)         (optional)			
Medium of instructions (Teaching)			English	English Q E		n Paper Language:
Maximum	Maximum Marks		Total: 100	Main Exam:	70	C.C.E: 30
Unit I		tral Theor pectrum	y in finite dime	nsional normed spa	ices. Regi	llar value resolvent set
Unit II			rties of Boundee lynomials.	d Linear Operators	resolvent	t and spectral mapping
Unit III	Spect Algel	tral redius bra, Furth	of a bounded l er properties of	inear operator on a Banach Algebras.	complex	banach space. Banach
Unit IV		pact linear ators.	r operators on n	ormed spaces, furt	her prope	rties of compact linear
Unit V	Spect	tral prope	rties of compact	linear operators.		
RecommendedWiley &Books2. G.F.		Wiley & 2. G.F.	Sons, New Yor	k 1978. coduction to Topo		vith applications. Jhon Modern Analysis Tata
Reference 2. N. science/ 3. G. B		Multipli 2. N. I	Halmos, Introctuion to Hilbert space and the theory of spectral licity, socond Edition, Chelsea Publishing Co New York, 1957. Dund Ford and J.T. Schwartz. Linear operator-3 part inter /Wile New Youk, 1958-74			
		3. G. Ba York 19	achman and L. Narcil, Functional analysis for academic press New			

Note : Setting is to be Done Strictly From Recommended Books.

# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies)

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Session:..... 2019-2019

#### Theory

Class		<b>M.Sc / M.A.</b>		Semest	er: IV		
Subject		Mathematics	Mathematics				
Title of the	e paper	Functional A	nalysis-II	Paper N	No : I		
Medium or (Teaching)	Aedium of instructions Teaching)		English Question English		on Paper Lan	iguage:	
Maximum	Marks	<b>Total: 100</b>	Main Exam:	70	70 C.C.E: 30		
Unit I		adjoint operator and ors positive operator.	l its properties, s	elf adjoint	, Unitary a	nd normal	
Unit II		rn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach corem for complex linear space and normed linear spaces.					
Unit III		t operators on normo t adjoint operator, Refl				erator and	
Unit IV		ry theorem - Baire's C f its application, strong					
Unit V		rgence of sequences of graph theorem, contra		ictionals, o	pen mappin	g theorem,	
Recommended Wiley Books 2. G		1. E.Kreyszig, Intro Wiley & Sons, New 2. G.F. Simmons, McGraw Hill, New	York 1978. Introduction to				
Reference		B. Choudhary an applications, Wiley		nda, Fun	ctional Ana	alysis with	

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class		M.Sc / N	<b>I.A</b> .		Semest	ter: IV	
Subject	Mathematics						
Title of the paper Medium of instructions (Teaching)		Integral Transform-II Paper No : II					
		English		Question Paper Language: English			
Maximum	Marks	Total:	100	Main Exam:	70 C.C.E: 30		30
Unit I	Fourier Tran	ısform, Infir	ite Fo	urier transform, (	Complex F	ourier trans	form.
Unit II	Finite Fourie	er Transforn	n and l	Fourier Integral.			
Unit III	Convolution Fourier trans		rseval	's Identity for Fo	urier series	s, Parseval's	Identity for
Unit IV	Application	for Fourier 7	Fransf	orm to Boundary	value pro	blems.	
Unit V	Introduction value proble		and 1	Mellin Transforn	ns, Fourie	r Series and	l Boundary
Recommen	nded	0		ns by Goyal and (			
BOOKS		ntegral Transforms by I.N. Sneddon. ntegral Transforms by Gupta and Vashishtha.					

Note : Setting is to be Done Strictly From Recommended Books.

# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics*

(As recommended by Board of studies)

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Session:..... 2018-2019.

#### Theory

lass		M.Sc / M.A		Semes	ter: IV		
Subject		Mathematic	CS .				
Title of the	e paper	Advanced C	Advanced Graph Theory-II		Paper No : III		
Medium of instructions (Teaching)		ons English	English		Question Paper Language: English		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I Unit II	Matrix Networ	t Matrix, Relationsh	t matrix and Rank o	of B, An a	pplication to	a switching	
Unit III		atic Number, chrom	atic Partitioning, c	hromatic	Polynomial	, Coverings	
Unit IV		ur color problem, di relations, Euler digra				igraphs and	
Unit V		with directed graphs A,B and C of Digrap				n Digraphs.	
Recommended by		<ol> <li>Graph theory with by Narsingh Deo</li> <li>Graph theory by</li> </ol>		Engineerir	ng and comp	outer science	

Note : Setting is to be Done Strictly From Recommended Books.

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#### Theory

Class			M.Se / M.A.		Semeste	er: IV	
Subject			Mathematics				
Title of the	paper		Operations Research-II Paper No : IV				
Medium of (Teaching)	instruct	ions	English Question Paper Lan English		guage:		
Maximum I	Marks		Total: 100	Main Exam:	70 C.C.E: 30		
Unit I		s Approxi		orth-West Corner I, MODI Method. Ex			
Unit II	0	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.					
Unit III	Metho	work analysis, constraints in Network, Construction of network, Critical Path thod(CPM) PERT, PERT calculation, Resource Leveling by Networks hniques and advances of network (PERT/CPM)					
		iques anu	auvances of ne	WORK (PERI/CPM)	)		
Unit IV	Simula	ation: Mo		ulation. Simulation		vorks, Advar	ntage and
	Simula Limita Game games	ation: Mo ation of Si theory- without	onte-Carlo Sim mulation. Two persons,	ulation. Simulation Zero-sum Games, Mixed strategies, (	of Netw Maximi	in-Minimax	principle,
Unit IV Unit V Recomment Books	Simula Limita Game games mx2 g	ation: Mo ation of Si theory- without ames, solu 1. Kant	onte-Carlo Sim mulation. Two persons, saddle points- ution by Linear	ulation. Simulation Zero-sum Games, Mixed strategies, ( Programming. K. Gupta and Mar	of Netw Maximi Graphica	in-Minimax I solution of	principle, 2xm and

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Sarojini I	Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for <i>Mathematics</i> (As recommended by Board of studies) Session:
	<ol> <li>G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.</li> <li>H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.</li> <li>Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand &amp; Company Ltd., New Delhi.</li> <li>N.S. Kambo, Mathematical Programming Techniques, Affiliated East- West Pvt, New Delhi, Madras.</li> </ol>

Note : Setting is to be Done Strictly From Recommended Books.

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Theory

Class			M.Sc / M.A.		Semeste	er: IV	
Subject			Mathematics				
Title of the paper Medium of instructions (Teaching)			Theory of Linear Operators-II		Paper No : V(l) (optional)		
		English Question English		on Paper Language:			
Maximum N	larks		Total: 100	Main Exam:	70	C.C.E: 30	
Unit I	involv	ing com	oact linear opera	itors.		s, Operator Equation	
Unit II	Alter	er theorems of Fredholm type, Bi-orthonormal system, Fredholm native, Equicontinuous sequence, compact integral operator.					
Unit III	of Bo	unded Se	ral properties of Bounded Self-Adjoint linear operators, Further Properties inded Self-Adjoint linear operators.				
Unit IV	Positi self a	ve opera djoint op	tors: Product of erators, square	positive operators roots of positive op	, monoton erator.	e sequences of bounded	
Unit V		ction O <sub>l</sub> ctions.	perators: Produ	ct and sum of pr	ojections.	Further properties of	
Recommended Wiley Wiley Wiley Wiley Wiley		Wiley & 2. G.F. Hill, No	& Sons, New Yo Simmons, Intr ew York.	rk, 1978. oduction to Topolo	ogy & Mo	with Application, John odern Analysis McGraw	
Reference 2. N.I		licity, Second Ec	lition, Chelsea Pub d J.T. Schwartz,	lishing co.	d the theory of Spectra Y.Y., 1957. operator-3 part inte		

Note : Setting is to be Done Strictly From Recommended Books.

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# Sarojini NaiduGovt.GirlsPostgraduate Autonomous college, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:.....2017-2018.

#### Theory

	Class	M.Se	c / M.A.		Semester: I	
S	ubject	Mathematics         Advanced Abstract Algebra-I         English				
Title o	f the paper			Paper	Paper No: I (Compulsory)	
	of instructions			Quest	ion Paper Lan	iguage:
(Te	eaching)				English	
Maxin	um Marks	Total 100	Main Exam:	70 C.C.E: 30		
Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.					
Unit II	Solvable & Nilpotent groups.					
Unit III			nomials, Algebraic nseparable extensi		nscendental ex	ttensions.
Unit IV	Perfect fields, F	inite fields, Alge	braically closed fie	lds.		
	Automorphism	of extension, G	alois extension. F	undamen	tal theorem of	of Galois
Unit V		on of polynomia ree.5 by radicals	l equations by r	adicals, i	nsolubility of	general
Recommend	led 1. I.N. H	Herstein, Topics i	n Algebra, Wiley I	Eastern, N	lew Delhi.	
Book		Bhattacharya, S.) bridge	K. Jain and S.R. N	lagpaul, B	Basic Abstract	Algebra,

Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.			Semester:	Ι
Subject		Mathematics				
Title of the pap	er	Real	Analysis	Paper 1	No: II (Con	npulsory)
Medium of instructions (Teaching)		English		Question Paper Language: English		
Maximum Mar	ks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I			istence of Riema tion and differentia		tjes integral	and its
Unit II		0	vector-valued fu terms of a series. F	,	Rectifiable s theorem.	curves.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.					
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R <sup>n</sup> Chain rule, partial derivatives, differentiation, and inverse function theorem.					
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,					
Recommended Books1. Walter Rudin, Principles of Mathematical Analysis, 1 Hill.				McGraw		
Reference	1. T.M. Apostal, Mathematical An2. H.L. Royden , Real Analysis, M					tion)

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.			Semester:	I
S	ubject	Matl	nematics			
Title o	f the paper	Тор	ology-I	Paper	No : III (Comj	pulsory)
Medium of instructions (Teaching)		English		Question Paper Language: English		iguage:
Maxim	um Marks	<b>Total: 100</b>	Main Exam:	70	C.C.E:	30
Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardin numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.					Cantor's
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.					
Unit III			g a topology in stems. Continuous			
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.					
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.					
Recommend Books	2. G.F. McG	Simmons, Int Fraw Hill.	logy- A first course troduction to Top ction to general top	pology a	nd Modern	

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Note : Setting is to be Done Strictly From Recommended Books.

Class Subject		M.Sc / M.A.		Semeste	er: I	]	
Subject			M.Sc / M.A.		er: 1		
0		Mathematics					
Title of the p	aper	Complex Anal	ysis-I	Paper N	No : IV (Co	mpulsory)	
Medium of instructions (Teaching)		English		Question Paper Language: English			
Maximum M	larks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Highe order derivatives						
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.						
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.						
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.						
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.					nitions and	
Recommend Books		Conway, Functions of one complex variable, Springer-verlag.				rlag.	

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Note : Setting is to be Done Strictly From Recommended Books

#### Theory

Class		M.Sc / M.A.		Semester: I				
Subject		Mathematics						
Title of the	e paper	Advanced Discrete Mathematics-I English		Paper No: V(l) (optional)				
Medium o (Teaching)	f instructions )			Questio English	n Paper La	inguage:		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30		
Unit I	groups and me		semi groups sub mo ence relation and n Theorem.		-			
Unit II		Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices						
Unit III	irreducible eler forms, minimiz	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.						
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.							
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph							
Recommen Books	McG	. Tremblay & R. Manobar, Discrete mathematical Structures, Graw Hill. Deo, Graph Theory with applications, Preritice-Hill.						
Noto . Sott		· <u>-</u>	commended Books.	,				

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Note : Setting is to be Done Strictly From Recommended Books.



# **M.Sc. SEMESTER II**

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Theory

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Class		M.Sc / M.A.	M.Sc / M.A.		Semester: II		
Subject		Mathematics					
Title of the	e paper	Advanced Ab	stract Algebra-II	Paper 1	No : I		
Medium of instructions (Teaching)		English		Question Paper Language: English			
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I		,	amples, sub mod Finitely generated	-			
Unit II	Simple module	es, Semisimple m	odules, Free modu	les, Schur	's lemma.		
Unit III	Noetherain & Artin theorem		es and rings, Hilb	ert basis	theorem. W	edderburn-	
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.						
Unit V	U	n , Similarity of I	on,Characterstics I linear transformat	· · · · ·	,		
Books Caml		bridge. Universi	S.K. Jain ,S K. N ty Press, (Indian E in Algebra , Wiley	dition)		ct Algebra,	

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class		M.Sc / M.A.		Semest	Semester: II			
Subject			Mathem	natics				
Title of the paper		Lebesque Measure & Integration		Paper I	Paper No : II			
Medium of instructions (Teaching)		English		Question Paper Language: English				
Maximum N	Aarks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable function Borel and Lebesgue measurability. Non-measurable sets.					functions.		
Unit II	0	ration of N ann and L	0		nctions. The Gener Is.	al integra	l. Integratio	on of Series,
Unit III					ns of Bounded van ntegration.	riation. Lo	ebesgue Dif	ferentiation
Unit IV	The L <sup>p</sup> -spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L <sup>p.</sup>							
Unit V	Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.							
<b>V</b> oolza			Barra ,Me Analysis b		theory and integra den.	tion .		

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

lass		M.Sc / M.A.	M.Sc / M.A.		Semester: II		
Subject		Mathematics					
Title of the	e paper	Topology-II		Paper I	No : III		
Medium of instructions (Teaching)		English	English		Question Paper Language: English		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	-	tioms T <sub>0</sub> ,T <sub>1</sub> ,T <sub>2</sub> ,T <sub>3</sub> ma. Tietze exten	,T4: their Characte sion theorem.	erizations	and basic	properties.	
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.					-	
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces.Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.						
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets.           Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.						
Unit V	The fundamental group and covering spaces-Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra.						
Recomme Books	nded Pv 2. G. Ma	t. Ltd. New Delhi F Simmons, In cGraw-Hill Book	troduction to Top	pology a	nd Moder	n Analysis,	

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Note : Setting is to be Done Strictly From Recommended Books.

#### Theory

Class			M.Sc / M.A.		Semester: II		I
Subject			Mathematics				
Title of the	paper		Complex Ana	lysis-II	Paper I	No : IV	
Medium of (Teaching)	instruction	ns	English		Questic English	on Paper La	nguage:
Maximum 1	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I			orization theo n's functional	prem. Gamma and equation	l its proj	perties. Rie	mann Zeta
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.						•
Unit III				Harmonic function reen's function.	on disc. I	Harnack ine	quality and
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.						
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem.         Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.						
RecommendedBooks1. J.B.			onway, Functi	ons of one complex	variable,	Springer-V	erlag.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class	M.Sc / M.A.			Semester: II			
Subject			Mathematics				
Title of the paper		Advanced Discrete Mathematics-II		Paper No : V(l) (optional)			
Medium of i (Teaching)	instruc	tions	English		Questio English	n Paper La	nguage:
Maximum N	larks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	circu	it matrix ,		hs, incidence matrix rix , directed graph		· •	
Unit II	,gene	Discrete numerical functions , Asymptotic behavior of numerical functions , generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.					ations with
Unit III	deriv	ation, sen		guages , Language anguage generated rammars.	· •		
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.						
Unit V	Reduced machines , Kleen's Theorem (statement only )Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.( definition only )						
Recommended McGraw Books		McGraw	Tremblay & R. Manobar, Discrete mathematical Structures, v Hill. o, Graph Theory with applications, Preritice-Hill			Structures,	
2. N. Dec			, Graph Theory	with applications,		11111	

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Note : Setting is to be Done Strictly From Recommended Books.



## **M.Sc. SEMESTER III**

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Theory

			J				
Class		M.Sc / M.A.		Semest	er: III		
Subject		Mathematics	Mathematics				
Title of the	paper	Functional Ar	alysis-I	Paper 1	No : I		
Medium of instructions (Teaching)		English		Questic English	on Paper La 1	nguage:	
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed li spaces Basic Properties of finite dimensional normed linear spaces.						
Unit II	IINormed linear subspace, equivalent norms, Ries'z lemma and compact quotient space of normed linear spaces and its completeness.					ompactness.	
Unit III	Linear operat	tor, Bounded linea	ar operator and co	ntinuous o	operators.		
Unit IV	Linear function	onal, bounded line	ear functional, Du	al spaces w	vith example	28.	
Unit V		e, orthogonal c on of functional or	omplements, ort a Hilbert spaces.	honormal	sets and	sequences.	
RecommendedWileyBooks2. G.		ey & sons, New Y G.F. Simmous, In	Kreyszig, Introductory functional analysis with application, Jhon y & sons, New York 1978. F. Simmous, Introductions to Topology & Modern Analysis, Tata Graw Hill, New York.				
Reference		Choudhary and Sudarshan Nanda, Functional Analysis with ications Wiley Eastern Ltd.					

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

Class	Class		M.Sc / M.A.		Semester: III			
Subject		Mathem	natics					
Title of the	paper		Integral	l Trans	sform-I	Paper N	No : II	
Medium of instructions (Teaching)		English			Question Paper Language: English			
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	_	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives Shifting theorem, convolution Theorem.						derivatives,
Unit II		cation to l nulates diff		-	ations, Application	n to Integ	ral equatio	ns. Solution
Unit III	-	ce Equatio ve equatio		dimen	sion, Wave Equati	on in one	dimension	Application
Unit IV	Appli	cation of I	aplace T	'ransfo	rm to electrical cir	cuits, App	olication to	Beams.
Unit V		Heat conduction equation in one dimension, Application to heat conduction equation.						
Dooks			egral Transforms by Goyal and Gupta. egral Transform by Sneddon.					

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

lass	ass		M.Sc / M.A.		Semeste	Semester: III		
Subject	Subject		Mathematics					
Title of the	paper		Advanced Gra	ph Theory-I	Paper N	No : III		
Medium of instructions (Teaching)		English		Questio	Question Paper Language: English			
Maximum	Marks		<b>Total: 100</b>	Main Exam:	70	C.C.E:	30	
Unit I	Revisio	n of grap	oh theoretic pre	liminaries. Isomo	rphism of g	raphs, subg	raphs.	
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs a components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circu The traveling salesman problem.						-	
Unit III	-	-	,	nce and centers i ircuits, spanning t	· · · · ·		e ,	
Unit IV		s, Prope parability		et, Fundamental	circuits and	d cut-sets, c	onnectivity	
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.							
Recommended Books by N			ph theory with applications to Engineering and Computer Science Narsingh Deo. Prentice Hall of India. ph theory by Harary.					

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Note : Setting is to be Done Strictly From Recommended Books.

Class			M.Sc / M.A.		Semester: III			
Subject			Mathematics					
Title of the p	oaper		<b>Operations Re</b>	esearch-I	Paper N	lo : IV		
Medium of instructions (Teaching)		tions	English		Questio English	n Paper Language:		
Maximum M	Iarks		Total: 100	Main Exam:	70	C.C.E: 30		
Unit I         Operations Research and its scope, Origin and Development of O           Research, Characteristics of Operations Research.						opment of Operations		
Unit II		Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.						
Unit III	Math	ematical F	ematical Formulation, Graphical Solution Method.					
Unit IV	artific	cial varial	r Programming Problem: Simplex Method exceptional cases, ble techniques; Big M method, two phase Method and Cyclic em of degeneracy.					
Unit V	Duali	ty, Fundar	nental propertie	es of duality and the	eorem of	duality.		
Recommend Book	ed		i Swarup, PO.K. Gupta and Manmohan, Operations Research, an Chand & Sons., New Delhi.					
		1. S.D. Sł	narma, Operatio	on Research.				
		2. F.S. H	Hiller and G.J.	Lieberman, Indus	strial Eng	gineering Series, 1995.		
				CD containing soft				
			•	gramming, Narosa I				
Reference		4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass.						

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Theory

### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise /Yearly Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2019-2020.

5. H.A. Taha, operations research- An introduction, Macmillan Publishing
Co. Inc., New York.
6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East- West Pvt.Ltd.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semester: III			
Subject			Mathematics					
Title of the paper		Theory of Line	ear Operators-I	Paper No : V(l) (optional)				
Medium of instructions (Teaching)		English		Questio English	on Paper La	anguage:		
Maximum N	Aarks		Total: 100	Main Exam:	70	C.C.E:	30	
Unit I         Spectral Theory in finite dimensional normed sp and spectrum.				nsional normed spa	ces. Regu	ılar value	resolvent set	
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral map theorem for polynomials.					ral mapping		
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Ba Algebra, Further properties of Banach Algebras.					ace. Banach		
Unit IV	Com opera		operators on n	ormed spaces, furth	ther properties of compact linear			
Unit V	Spect	ral proper	ties of compact	linear operators.				
Recommend	led		reyszing, Introductory functional analysis with applications. Jhon Sons, New York 1978.					
Books		2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,						
				uion to Hilbert sp ion, Chelsea Publis				
Reference	Reference		2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74					
		3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.						

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Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise /Yearly Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2019-2020.



# **M.Sc. SEMESTER IV**

Signature of members of B.O.S ------

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				Theory				
Class			M.Sc / M.A.		Semeste	Semester: IV		
Subject			Mathematics					
Title of the	paper		Functional An	alysis-II	Paper N	No : I		
Medium of instructions (Teaching)		ions	English		Questio English	n Paper Lar	iguage:	
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30	
Unit I		rt adjoint o tors positivo		its properties, se	lf adjoint,	, Unitary a	nd normal	
Unit IIZorn's Lemma Hahn-Banach Thorem for real theorem for complex linear space and normed linear						<b>•</b> ,	hn-Banach	
Unit III	•	-	ors on normed spaces, relation between adjoint operator and operator, Reflexive spaces, Reflexivity of Hilbert space.					
Unit IV	U			tegory theorem, un and weak converge			eorem and	
Unit V		0	sequences of o prem, contract	perators and function theorem.	tionals, o <sub>l</sub>	pen mappin	g theorem,	
RecommendedWileBooks2. G		Wiley & 2. G.F	Kreyszig, Introductory Functional Analysis with applications, John y & Sons, New York 1978. J.F. Simmons, Introduction to Topology & Modern Analysis raw Hill, New York.					
Reference			Choudhary and Sudarshan Nanda, Functional Analysis with ications, Wiley Eastern Ltd.					

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Theory

Note : Setting is to be Done Strictly From Recommended Books.

### Theory

Class		M.Sc / M.A.		Semest	Semester: IV			
Subject	Subject		Mathematics					
Title of the paper		Integral Transform-II		Paper I	No : II			
Medium of instructions (Teaching)		English		-	Question Paper Language: English			
Maximum	Maximum Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Fouri	er Transfo	orm, Infir	nite For	urier transform, (	Complex F	ourier trans	form.
Unit II	Finite	Fourier T	Transform	n and I	Fourier Integral.			
Unit III		olution the er transfo	-	erseval'	's Identity for Fou	irier series	, Parseval's	Identity for
Unit IV	Appli	cation for	Fourier 7	Fransfo	orm to Boundary	value prob	lems.	
Unit V		Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems						
Recommen	nded		tegral Transforms by Goyal and Gupta.					
DUUKS		egral Transforms by I.N. Sneddon. egral Transforms by Gupta and Vashishtha.						

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

lass				.A.		Semes	Semester: IV		
Subject			Mathema	Mathematics					
Title of the	paper		Advanced	d Gra	ph Theory-II	Paper	No : III		
Medium of instructions (Teaching)		English			Questi	Question Paper Language: English			
Maximum N	Marks		Total: 1	00	Main Exam:	70	C.C.E:	30	
Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.								
Unit II	Cut-set matrix		, Relations	ships	among Af, Bf a	nd Cf, p	oath matrix,	Adjacency	
Unit III	Chrom matchi		nber, chro	omati	c Partitioning, ch	romatic	Polynomial,	Coverings,	
Unit IV			-		ted graph, some t s, Directed paths a		<b>.</b> .	graphs and	
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.								
Recommended Books by N		by N	ph theory with applications to Engineering and computer science Narsingh Deo.				uter science		
		2. Gra	ph theory b	y 11a	1 a1 y •				

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Note : Setting is to be Done Strictly From Recommended Books.

Class			M.Sc / M.A.		Semester: IV			
Subject			Mathematics					
Title of the paper		<b>Operations Re</b>	search-II	Paper N	lo : IV			
Medium of i	instruc	tions	English		-	n Paper Language:		
(Teaching)			0		English			
Maximum N	Aarks		Total: 100	Main Exam:	70	C.C.E: 30		
	Tran	sportation	problems: No	orth-West Corner	Method	Least-Cost Metho	od.	
Unit I	Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.							
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.							
	Network analysis, constraints in Network, Construction of network, Critical Path							
Unit III			CPM) PERT, PERT calculation, Resource Leveling by Networks es and advances of network (PERT/CPM)					
	Cimu	lation: Monte-Carlo Simulation. Simulation of Networks, Advantage and						
Unit IV		tation of Si		mation, Simulation	OI NELW	orks, Auvantage a	na	
	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle,							
Unit V	games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.							
		games, son	LIUII Dy LIIIear	i rogramming.				
Recommend	led	1. Kant	ti Swarup, P.K	. Gupta and Mar	nmohan,	<b>Operations Research</b>	ch,	
Books		Sult	an Chand & Soi	ns, New Delhi.				
		1. S.D.	Sharma, Operat	ions Research.				
		2. F.S.	Hiller and G.J.	Lieberman, Indus	strial En	gineering Series, 19	995	
Reference		(This book comes with a CD containing Software)						
		3. G.Ha	3. G.Hadley, linear programming, Narosa Publishing House, 1995.					

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Theory

4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading
mass.
5. H.A. Taha, Operations Research,- An Introduction Macmillan
Publishing.
6. Prem Kumar Gupta and D.S. Hira, Operations Research, an
Introduction S.Chand & Company Ltd., New Delhi.
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-
West Pvt, New Delhi, Madras.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semester: IV		
Subject			Mathematics				
Title of the paper		Theory of Line	ear Operators-II	Paper No: V(l) (optional)			
Medium of instructions (Teaching)		English		Questio English	n Paper Language:		
Maximum N	Aarks		<b>Total: 100</b>	Main Exam:	70	C.C.E: 30	
Unit I	I Further spectral properties of compact linear operators, Operative involving compact linear operators.					s, Operator Equation	
Unit II		ther theorems of Fredholm type, Bi-orthonormal system, Fredho ernative, Equicontinuous sequence, compact integral operator.					
Unit III		ral proper unded Self	rs, Further Properties				
Unit IV		-	-	positive operators, r pots of positive oper		sequences of bounded	
Unit V		ction Ope ctions.	rators: Product	t and sum of proj	jections.	Further properties of	
RecommendedWiley &Books2. G.F. S		Wiley &	eyszing, Introductory Functional Analysis with Application, John z Sons, New York, 1978. Simmons, Introduction to Topology & Modern Analysis McGraw w York.				
Reference Multiplic 2. N.Du		Halmons, Introduction to Hilbert space and the theory of Spectral acity, Second Edition, Chelsea Publishing co. Y.Y., 1957. und Ford and J.T. Schwartz, Linear operator-3 part inter Wiley, New York.					

Note : Setting is to be Done Strictly From Recommended Books.

**Course:** 

### B.Sc. (3 Years Degree Course)

Signature of members of B.O.S ------

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	(As recomr Sess		2019-2		163)
	Sche	me of ex	caminatior	۱	
			Marks		
<b>T</b> I		Theory	C.C.E	Total	
Theory Papers	Title of paper		I+II+III+IV		Compulsory/Optiona
		150	50	200	
	B	S.SC.I-YEA	R		
Paper I	Algebra and Trigonometry	50			Compulsory
-	Calculus & Differential	50			Compulsory
Paperll	Equations		50	200	
Paper III	aper III Vector Analysis & 50 Geometry		Compulsory		
	B.	SC. II YEA	AR		
Paper 1	Abstract Algebra	50			Compulsory
Paper II	Advanced Calculus	50	50	200	Compulsory
Paper III	Differential Equations	50			Compulsory
	B.	SC. III YE	AR		
	Linear Algebra &	50			Compulsory
Paper	Numerical Analysis				
Danar	Real & Complex	50	50	200	Compulsory
Paper	Analysis				
Paper	Discrete Mathematics	50			Optional
5	Signature of members of E	3.0.S			

Scheme of examination

### Course:

M.Sc. (2 Years Degree Course)

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Theory	Title of paper	Compulsory/Opt		Mark	s
Papers		ional	Theor y	C.C .E	Total
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100
Paper II	Real Analysis	Compulsory	70	30	100
Paper III	Topology-l	Compulsory	70	30	100
Paper IV	Complex Analysis-I	Compulsory	70	30	100
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
		SEMESTER II			
Paper I	Advanced Abstract Algebra- II	Compulsory	70	30	100
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100
Paper III	Topology-II	Compulsory	70	30	100
Paper IV	Complex Analysis-II	Compulsory	70	30	100

Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
		SEMESTER III			
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
		SEMESTER IV			
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100
Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory			50
Paper VII	Internship	Compulsory			100

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise /Yearly Syllabus for Mathematics (As recommended by Board of studies) 

# **Syllabus**

2019-2020

### **Semester / Yearly Pattern Subject: MATHEMATICS**

	CONTENTS		Page No.
Under Graduate Level			
	Theory Paper	B.Sc.I Year	1-6
	,, ,,	B.Sc.II Year	7 - 12
	,, ,,	B.Sc.III Year	13 - 19
Post Graduate Level			
	Theory Paper	Semester I	20 - 24
	,, ,,	Semester II	25 - 29
	,, ,,	Semester III	30 - 34
	,, ,,	Semester IV	35 - 40

Date of submission in Autonomous Examination cell:

		Signature
Signature of members of B.O.S	 	

### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise /Yearly Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2019-2020.

*H.O.D*.

Signature of members of B.O.S ------

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### Sarojini NaiduGovt.GirlsPostgraduate Autonomous college, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:.....2017-2018.

Class				B.Sc./B.A.		Semester: III
Cias	5			D.30./B.A.		Semester: III
Subject		(English)		Mathematics		Paper No.: I
		fgUn	h	xf.kr		
		(English)		Real Analysis, Differentia Algebra	l Equa	ation, Abstract
Title of the pap	er	fgUn	h	okLrfod fo'ys"k.	<] v	ody lehdj.k]
				vewrZ cht&xf.kr	•	, , ,
Medium of instructions (Teaching)				Both English & fgUnh	Lang	tion Paper uage: Both nh & English
Maximum Mark	s	Total: 1	50	Main Exam :100	C.C.E : 50	
U	nit	I		Syllabus		
	(English)		sec Ca nec tes Lei	finition of a sequence, T quences, Bounded and uchy's convergence crite gative terms, Comparison t, Ratio test, Raabe's bnitz's theorem, Absol nvergence	monot erion, test, test,	onic sequences, Series of non- Cauchy's integral
Unit I		gUnh	lhe vu eki rqy	qØe dh ifjHkk"kk ekvksa ij izes;] i qØe] dkW"kh d inaM] vkkRed i yuk ijh{k.k] dkW {k.k] vuqikr ijh{k.k]	ifjc) Is nksa /"kh	,oa ,dfn"V vfHklj.k dk a dh Js.kh] dk lekdy

Theory

		ijh{k.k] y?kqx.kdh; ijh{k.k] fycuht dk izes;] fujis{k ,oa lkis{k vfHklj.kA
	(English)	Series Solution of Differential Equations-Power series Method, Bessel's Equation ,Bessel's function and its properties, recurrence and generating relations, Legendre's Equation, Legendre's function and its properties, recurrence and generating relations.
Unit II	fgUnh	vody lehdj.kksa dh Js.kh gy] ?kkr&Js.kh fof/k] csly dk lehdj.k] csly dk Qyu ,oa mlds xq.k/keZ] iqujkxeu ,oa tud laca/k] yhts.Mj dk lehdj.k] yhts.Mj dk Qyu ,oa mlds xq.k/keZ] iqujkxeu ,oa tud laca/kA
Unit III	(English)	Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorem, Differentiation and integration of transforms, Inverse Laplace transforms, Convolution theorem, Applications of Laplace transformation in solving linear differential equations with constant coefficients.

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### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

	fgUnh	yklykl :ikarj.k] yklykl :ikarj.kksa dh ykafcdrk] yklykl :ikarj.ksa dk vfLrRo izes;] vodyksa ,oa lekdyksa ds yklykl :ikarj.k] LFkkukarj.k izes;] :ikarj.kksa dk vodyu ,oa lekdyu] izfrykse yklykl :ikraj.k] leyu izes;] vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa yklykl :ikarj.kksa ds vuqiz;ksxA
	(English)	Definition and basic properties of group, Order of an element of a group, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.
Unit IV	fgUnh	lewg dh ifjHkk"kk ,oa ewyHkwr xq.k/keZ] lewg ds vo;o dh dksfV] milewg] milewgks dk chtxf.krA pØh; lewg ,oa muds lk/kkj.k xq.k/keZ] lg leqPp; foHkktu ,oa lacaf/kr izes;]

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		ysxzkats izes; ,oa mlds fuxeuA
	(English)	Normal sub group, Quotient groups, homomorphism and isomorphism of groups, Kernel of homomorphism of groups, fundamental theorem of homomorphism of groups, Permutation groups ( even and odd permutations), Alternating groups A <sub>n</sub> , Cayley's theorem.
Unit V	fgUnh	izlkekU; milewg] foHkkx lewg] lewgksa dh ledkfjrk ,oa rqY;dkfjrk] ledkfjrk dh vf"V] lewgks dh ledkfjrk dk ewyHkwr izes;] Øep; lewg ¼le ,oa fo"ke Øep;½ ,dkarj lewg An dSyh dk izes;-
Recommended Books	(English)	<ol> <li>R.R. Goldberg, Real Analysis, I.B.H. Publishing Co. New Delhi, 1970.</li> <li>Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd. Allahabad.</li> <li>Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley &amp; sons, 1999.</li> <li>I. N. Herstein – Topics in Algebra, Wiley Eastern Ltd. New Delhi 1977.</li> </ol>

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	5. Sharma and Gupta-Integral Transform, Pragati Prakashan Meerut
fgUnh	1- e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA

Signature of members of B.O.S ------

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# **B.Sc. SEMESTER IV**

### Theory

Class	3		B.Sc./B.A.		Semester: IV	
Cubicot	(Englis	h)	Mathematics		Demon No I	
Subject	fgUn	h	xf.kr		Paper No.: I	
<b></b>	(Englisl	h)	Abstract Algebra, Advan Differential equation, cor			
Title of the pape	er fgUn	h	vewrZ chtxf.kr iz	xr o	dyu] vkaf'kd	
			vodyu lehdj.k ,oa	lfeJ	fo'ys"k.k	
Medium of instructions (Teaching)			Both English & fgUnh	Lang	stion Paper juage: Both nh & English	
Maximum Mark	s Total : 15	0	Main Exam :100	C.C.I	E : 50	
U	nit		Syllabus			
	(English)	of ce cla	roup automorphisms, inne automorphisms, Conju entraliser, Normaliser, Cou ass equation of a finite gro r finite abelian groups and	igacy inting oup, C	relation and principle and the Cauchy's theorem	
Unit I	fgUnh	Lo la iz dl	wg Lodkfjrk ¼ odkfjrk] Lodkfjrk ;qXerk laca/k ,oa lkekU;d] x.kuk fl)k k oxZ lehdj.kA if u&vkcsyh lewgksa	vksa a d: ar ,c jfer	dk lewg] sUnzh;dkj.k] oa ifjfer lewg vkcsyh ,oa	

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		izes;A
		Introduction to rings, subrings, integral domains and fields, simple properties and examples, ring
	(English)	homomorphism, ideals and quotient rings.
		oy;] mioy;] iw.kZdkyh; izkar ,oa
11-1-11		{ks= dk ifjp; ljy xq.k/keZ ,oa
Unit II	fgUnh	mnkgj.k] oy; lekdkfjrk] xq.ktkoyh
		,oa foHkkx oy;A
		Maxima, Minima and saddle points of functions of
	(English)	two variables, Improper integrals and their convergence, Comparison test, Abel's and
		Dirichlet's tests, Beta and Gamma functions.
		nks pjksa ds Qyuksa dk mfPp"B]
Unit III		fufEu"B ,oa IsMy fcUnq] fo"ke
	fgUnh	lekdy ,oa mudk vfHklj.k] rqyuk
		ijh{k.k] vkcsy ,oa fMfjDys dk ijh{k.k]
		chVk ,oa xkek QyuA
	(English)	Partial Differential equations of the first order.
		Lagrange's solution. Some special types of

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### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

Unit IV		equations which can be solved sold easily by methods other than general methods Charpit's general methods of solution, Partial differential equations of second and higher orders. Homogeneous and non- Homogeneous equations with constant coefficients
	fgUnh	izFke dksfV ds vkaf'kd vody lehdj.k] ysxzkats dk gy] dqN fof'k"V izdkj ds lehdj.k ftUgsa O;kid fof/k ds vykok ljy fof/k ls gy fd;k tk ldsa] gy ds fy, pkjfiV dh O;kid fof/k] }rh; ,oa mPprj dksfV ds vkaf'kd vody lehdj.k] vpj xq.kkadksa ds le?kkrh; ,oa vle?kkrh; lehdj.k] vkaf'kd vody lehdj.k tks vpj xq.kkadksa okys lehdj.kksa esa ifjorZuh; gSA
Unit V	(English)	Continuity and differentiability of Complex functions, Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed points, cross ratio
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	:ikarj.k] fLFkj fcUnq] fr;Zad vuqikrA		
Recommended Books (Engl	<ol> <li>T.M. Apostol, Mathematical Analysis Narosa Publishing House, New Delhi 1985</li> <li>N. Piskunov , Differential and Integral Calculus, Peace Publishers, Moscow.</li> <li>S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi.</li> <li>N. Jacobson, Basis Algebra, Vols, I &amp; II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company.)</li> <li>Shanti Narayan, A Text Book of Modern Abstract Algebra, S. Chand &amp; Co. New Delhi</li> <li>P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.</li> <li>I. S. Luther and I.B. S. Passi, Alegebra Vol- I , II, Narosa Publishing House.</li> <li>R. V. Churchill &amp; J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hili New. York. 1990</li> <li>Mark; J. Ablowitz &amp; A. S. Fokas. Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998</li> <li>Ponnuswarny : Complex Analysis, Narosa Publishing Co.</li> </ol>		

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fgUnh	iqLrdsaA			

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# **B.Sc. SEMESTER V**

Class			B.Sc./B.A.		Semester: V		
Subject		(English	)	Mathematics		<b>_</b>	
		fgUnh		xf.kr		Paper No.: I	
Title of the paper		(English)		Linear Algebra, Numerical Analysis			
		fgUnh		jS[kh; chtxf.kr] la[;kRed fo'ys"k.k			
Medium of instructions (Teaching)			Both English & fgUnh	Question Paper Language: Both <b>fgUnh</b> & English			
Maximum Mark	S	Total : 150	)	Main Exam :100	C.C.I	E : 50	
Unit		Syllabus					
Unit I		English)	subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite			m of subspaces. e, independence Basis, Finite ence theorem for of elements of a	
	f	gUnh	Ifn'k lef"V dh ifjHkk"kk ,oa mnkgj.k] milef"V] milef"V;ksa dk ;ksx ,oa Ih/kk ;ksx] jSf[kd foLr`fr] jSf[kd vkfJrrk] Lora=rk ,oa muds ewy xq.k/keZ] vk/kkj] ifjfer foeh; Ifn'k				

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### Theory

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Unit II	(English)	Linear transformations and their representation as matrices. The algebra of linear transformations. The rank - nullity theorem, Eigen values and eigen vectors of a liner transformation, Diagonalisation, Quotient space and its dimension.		
	fgUnh	jSf[kd :ikarj.k ,oa mudk vkO;wg fu:i.k] jSf[kd :ikarj.kksa dk cht xf.kr] tkfr 'kwU;rk izes;] jSf[kd :ikarj.kksa ds vk;xu eku ,oa vk;xu lfn'k fod.khZdj.k] foHkkx lef"V ,oa mldh foekA		
Unit III	(English)	Approximations, Errors and its types, Solution of Equations: Bisection, Secent, Regula Falsi, Newton-Raphson Method and their order of convergence, roots of second degree Polynomials, Interpolation: Lagrange interpolation, Divided		

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### Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

		Differences,InterpolationformulaeusingDifferencesandderivationsofInterpolationformula.IfUudVu]=qfV;ka,oamldsizdkj]lehdj.kksadsgyf}Hkktu]IhdsUV]jsX;qykQkYIhrFkk
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	(English)	Linear Equations : Direct Methods for Solving Systems of Linear Equations, Gauss elimination, Gauss Jordan Method, LU Decomposition, Cholesky Decomposition, Iterative Methods: Jacobi Method, Gauss - Seidel Method, Relaxation Method, Methods Based on Numerical Differentiation.
Unit IV	fgUnh	jSf[kdlehdj.k % jSf[kd lehdj.kksa ds fudk; dks gy djus dh izR;{k fof/k;ka]

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Unit V	(English)	Ordinary Differential Equations: Euler Method, Eulers Modified Method, Single-step Methods Runge-Kutta's Method, Multi-step Methods, Milne Method, Numerical Quadrature, Newton-Cote's Formulae, Gauss Quadrature Formulae, Methods Based on Numerical Integration with their derivation.
	fgUnh	Ik/kkj.k vody lehdj.k vk;yj fof/k] vkyj la'kksf/kr fof/k] ,dy pj.k fof/k] :ax&dqVVk fof/k] cgqpj.k fof/k] feyus fof/k] la[;kRed {ks=dyu] U;qVu dksV~l lw=] xkml {ks=dyu lw=] la[;kRed lekdyu ij vk/kkfjr fof/k;ka ,oa mudh mRifRrA

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Recommended Books	(English)	<ol> <li>K. Hofman and R.Kunze, Linear Algebra, 2nd Edition, Prentice Hall Englewood Cliffs, New Jersey 1971.</li> <li>C.E. Frooerg. Introduction to Numerical Analysis(Second Edition L Addison-Wesley- 1979.</li> <li>M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods Probles and Solutions, New Age International (P) Ltd, 1996.</li> </ol>
Reference Book		<ol> <li>E. Balaguruswamy - Numerical Method Tata Mc Graw_ Hill Pub. Com - New Yark</li> <li>K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd, New Delhi, 2000</li> </ol>
		<ol> <li>S.K. Jain, A Gunawardena &amp; P.B.</li> <li>Bhattacharya, Basic Linear Algebra with MATLAB</li> <li>Key college Publishing (Springer-Verlag) 2001.</li> <li>S.Kumarsaran, Linear Algebra A Geometric</li> <li>Approach Prentice _ Hall of India) 2000.</li> </ol>
	fgUnh	e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA

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# **B.Sc. SEMESTER VI**

#### Class B.Sc./B.A. Semester: VI (English) **Mathematics** Subject Paper No.: I fgUnh xf.kr Real Analysis, Discrete Mathematics and (English) statistics. Title of the paper okLrfod fo'ys"k.k] fofoDr xf.kr ,oa fgUnh lkaf[;dh **Question Paper Both English & Medium of instructions** Language: Both (Teaching) fgUnh fgUnh & English Total : 150 Main Exam :100 C.C.E: 50 Maximum Marks Unit **Syllabus** Riemann integral, Algebra of Riemann integrable functions. Integrability of continuous and monotonic functions. The fundamental theorem of (English) integral calculus, Mean velue theorems of integral calculus. Unit I jheku lekdy] jheku lekdyuh; Qyuksa dk cht xf.kr] Irr ,oa ,dfn"V Qyuksa fgUnh dh lekdyuh;rk] lekdyu dk ewyHkwr izes;] lekdyuksa ds ek/;eku izes; Definition and examples of metric spaces, (English) Neighborhoods, Limit points, Interior points, Open

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## Theory

# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

Unit II		and closed sets, Closure and interior, Boundary points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Definition of Continuous functions and its illustrations.				
	fgUnh	nwjhd lef"V dh ifjHkk"kk ,oa mnkgj.k lkehl;] lhek fcUnq] var% fcUnq] foo`Rr ,oa lao`r leqPp;] laoj.kd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dkS'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :l esa okLrfod la[;k;sa lrr Qyu dh ifjHkk"kk ,oa mlds mnkgj.kA				
Unit III	(English)	Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of propositions, Quantifiers: Universal and Existential Quantifiers, Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.				
	fgUnh	rdZ dk cht xf.kr] iqu:fDr;ksa dk fojks/k dk iqujkoyksdu] rkfdZd rqY;rk] lk/;ksa dk chtxf.kr]				
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	(English)	Boolean Function, Disjunction and Conjunction Normal Forms, Bools Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial order Relation.
Unit IV	fgUnh	cwyh; Qyu fo;kstuh; ,oa la;kstuh; izlkekU; :i] cwy dk izlkj izes; f}pj laca/k] rqY;rk laca/k] foHkktu ,oa vkaf'kd Øe laca/kA
Unit V	(English)	Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation, expectation of sum and product of random variables, Moment generating function , Theoretical distribution: Binomial, Poisson distributions and their properties and uses.
	fgUnh	izkf;drk] Irr izkf;drk] izkf;drk ?kuRo

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		;ksx ,oa xq.ku dh izR;k'kk] vk?kw.kZ tud Qyu] IS)kafrd caVu% f}in ikW;tu caVu rFkk mlds xq.k/keZ ,oa mi;ksxA
Recommended Books	(English)	<ol> <li>R.R. Gpldberg, Real Analysis, Oxford &amp; IBH Publishing Co., New Delhi, 1970.</li> <li>G.F. Simmons. Introduction to Topology and Modem Analysis, McGraw-Hill, 1963.</li> <li>T.M. Apostol, Mathematical Analysis, Norosa Publishing House. New Delhi, 1</li> <li>C.L. Liu., Elements of Discrete Mathematics (Second Edition), McGraw Hill, International Editiojns, Computer Science scries 1986.</li> </ol>
Reference Book		1. T.M. Apostol, Mathematical Analysis, Norosa Publishing House, New Delhi, 1985.

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	<ol> <li>S.Lang. Undergrauate Anallysis, Springger- Veriag, New York, 1983.</li> </ol>
	<b>3</b> , , , , , , , , , , , , , , , , , , ,
	3. D.Somasundaram and B.Choudhary, A first
	Course in Mathematical Analysis. Narosa
	Publshing House, New Delhi, 1997.
	4. Shanti Narayan, A Course of Mathematical
	Analysis. S.Chand & Co. Delhi.
	5. R.K.Jain and S.K. Kaushik, An introductions to
	Real Analysis, S.Chand & Co., 2000.
	6. P.K. Jain and K/Ahmed Matric Spaces, Narosa
	Publishing House New Delhi, 1996.
	7. S.Lang, Undergraduate Analysis, Ppringer-
	Verlag, New Youk 1983.
	8. E.T. Copson, Metric Spaces, Combridge
	University Press, 1968.
	9. S.Lang. Undergraduate Analysis, Springer-
	Veriag, New Youk 1983.
	1. Statistics by M.Ray.
	2. Mathematical Statistics by J.N.Kapoor,
Elementary	H.C.Saxena (S.Chand)
Statistics	3. Fundamentals of Mathematical Statistics,
	Kapoor and Gupta.

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# **M.Sc. SEMESTER I**

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### Theory

Class		M.S	c / M.A.		Semester: I	
Subject		Mathematics				
Title o	f the paper	Advanced Ab	ostract Algebra-I	Paper	No: I (Comp	oulsory)
	(Teaching)		ion Paper Lan English	on Paper Language: English		
Maxin	num Marks	Total 100	Main Exam:	70	C.C.E:	30
Unit I	Normal & Subn	ormal series of g	groups, Compositio	on series,	Jordan-Holde	r series.
Unit II	Solvable & Nilp	otent groups.				
Unit III		1 0	nomials, Algebraic nseparable extensi		nscendental ex	tensions.
Unit IV	Perfect fields, F	inite fields, Alge	braically closed fie	lds.		
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.					
Recommended Book1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi.2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract A Cambridge				Algebra,		

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Note : Setting is to be Done Strictly From Recommended Books.

## Theory

Class M.Sc / M			c / M.A.		Semester:	Ι
Subject		Math	nematics			
Title of the pape	er	Real	Analysis	Paper 1	No: II (Con	npulsory)
Medium of instructions (Teaching)		English		Question Paper Langua English		nguage:
Maximum Mar	ks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I			istence of Riema ion and differentia		jes integral	and its
Unit II		0	vector-valued fu terms of a series. F	nctions, Riemann'	Rectifiable s theorem.	curves.
Unit III	conv M-to and	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.				eierstrass nvergence
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of $\mathbb{R}^n$ Chain rule, partial derivatives, differentiation, and inverse function theorem.					
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,					
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.				McGraw	
Reference		<ol> <li>T.M. Apostal, Mathematical Analysis Narosa.</li> <li>H.L. Royden , Real Analysis, Macmillan (Indian Edition)</li> </ol>				ion)

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

	Class	M.S	c / M.A.		Semester:	I
Subject		Math	Mathematics			
Title of the paper     Topology-I     Paper		Paper	Paper No : III (Compulsory)			
	of instructions eaching)	Eı	nglish	Question Paper Language English		
Maxim	um Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	numbers and i	ntable and uncountable sets. Infinite sets and Axiom of Choice. Card bers and its arithmetic. Schroeder-Bernstein theorem. Statement of Canto rem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.			Cantor's	
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subset Neighborhoods, interior exterior and boundary. Accumulation points and derive sets. Bases and sub-bases, Subspaces and relative topology.					
Unit III			g a topology in stems. Continuous			
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.			s. Second		
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.			ponents,		
Recommend Books	2. G.H Mc	Munkres, Topology- A first course. Prentice-hall of India. . Simmons, Introduction to Topology and Modern Analysis, Graw Hill. . Joshi, Introduction to general topology, Wiley Eastern.			Analysis,	

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

Class	M.Sc / M.A.			Semest	er: I	
Subject	Subject					
Title of the j	paper	Complex Anal	ysis-I	Paper N	No : IV (Co	mpulsory)
Medium of i (Teaching)	instructions	English		Questio English	n Paper La	nguage:
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Hig order derivatives			ula, Higher		
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundament theorem of algebra. Taylor's theorem.			undamental		
Unit III		Aeromorphic f	ciple. Schwartz le unction theorem, em.			
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.			es of many		
Unit VBilinear transformations, their properties an examples of conformal mappings.				classific	ation. Defin	nitions and
Recommend Books		Conway, Functio	ns of one complex v	variable,	Springer-ve	rlag.

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Note : Setting is to be Done Strictly From Recommended Books

## Theory

Class		M.Sc / M.A.		Semeste	er: I	
Subject		Mathematics				
Title of the	paper	Advanced Disc Mathematics-I		Paper N	No: V(l) (o	ptional)
Medium of (Teaching)	instructions	English		Questio English	n Paper La	nguage:
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	01	onoids. Congru	semi groups sub me ence relation and n Theorem.		-	
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices				0	
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Join irreducible elements, minterms, maxterms, minterm Boolean forms, canonica forms, minimization of Boolean functions. Applications of Boolean Algebra t switching theory (Using AND, OR, & NOT gates) the Karnaugh method.				s, canonical Algebra to	
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.					
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut- & circuits, Connectivity and Separability, Planar graphs, Kuratowski's graphs, Euler's formula for planar graph					
Recommended       1.       J.P. Tremblay & R. Manobar, Discrete mathematical Struct         Books       McGraw Hill.         2.       N. Deo, Graph Theory with applications, Preritice-Hill.				Structures,		

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Note : Setting is to be Done Strictly From Recommended Books.



# **M.Sc. SEMESTER II**

### Theory

Class		M.Sc / M.A.		Semeste	Semester: II		
Subject		Mathematics					
Title of the j	paper	Advanced Abs	tract Algebra-II	Paper N	No : I		
Medium of instructions (Teaching)		English		Questio English	n Paper La	nguage:	
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.						
Unit II	Simple module	s, Semisimple mo	odules, Free modu	les, Schur'	s lemma.		
Unit III	Noetherain & Artin theorem.	Artinian module	es and rings, Hilb	ert basis t	heorem. Wo	edderburn-	
Unit IV		, ,	modules, Noether ver a principal ide			ındamental	
Unit V	Algebra of linear transformation, Characterstics roots, Matrices, Matrix of linear transformation, Similarity of linear transformation, invariant spaces, Reduction to triangular forms.						
Recommend Books	Cam	Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, oridge. University Press, (Indian Edition) erstein ,Topics in Algebra , Wiley Eastern , New Delhi.					

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / N	M.A.		Semest	er: II	
Subject			Mathematics					
Title of the paper		Lebesque Measure & Integration		Paper No : II				
Medium of instructions (Teaching)		English		-	Question Paper Language: English			
Maximum N	Aarks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.							
Unit II	0	ration of N ann and L	0		actions. The Gene ls.	ral integra	l. Integratio	n of Series,
Unit III		Four deriv rem, Differ			ns of Bounded vantegration.	riation. L	ebesgue Diff	erentiation
Unit IV		L <sup>p</sup> -spaces, alities. Co			ons, jensen's ine "	quality. H	lolder and	Minkowski
Unit V		Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.						
			Barra ,Measure theory and integration . Analysis by Royden.					

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

lass		M.Sc / M.A.		Semester: II			
Subject		Mathematics					
Title of the	e paper	Topology-II	Topology-II		lo : III		
Medium of instructions (Teaching)		English	English		Question Paper Language: English		
Maximum	Marks	Total: 100	Main Exam:	70	C.C.E:	30	
Unit I	Separation axioms T <sub>0</sub> ,T <sub>1</sub> ,T <sub>2</sub> ,T <sub>3</sub> ,T <sub>4</sub> : their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.						
Unit II	compactness	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.					
Unit III	characterizat Connectedne	tions. Projection	y in terms of maps. Separation aces. Compactness a luct space.	axioms	and prod	uct spaces.	
Unit IV	Compactness	and nets. Filters a	nd convergence of and their convergen tra-filters and comp	ce. Cano			
Unit V	The fundamental group and covering spaces-Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra.						
Recommer Books	nded P 2. G N	vt. Ltd. New Delhi J.F Simmons, In IcGraw-Hill Book	nes R. Munkres Topology, A First Course. Prentice Hall of India t. Ltd. New Delhi. F Simmons, Introduction to Topology and Modern Analysis, Graw-Hill Book Company. D.Joshi, Introduction to General Topology,Wiley Eastern.				

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Note : Setting is to be Done Strictly From Recommended Books.

## Theory

Class			M.Sc / M.A.		Semest	Semester: II	
Subject			Mathematics				
Title of the paper			Complex Ana	lysis-II	Paper N	No : IV	
Medium of instructions (Teaching)		ions	English		Questio English	on Paper La	inguage:
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I			ctorization theo nn's functional	orem. Gamma an equation	d its proj	perties. Rie	emann Zeta
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.						
Unit III			tion principle. I let problem. G	Harmonic function reen's function.	on disc. I	Iarnack ine	equality and
Unit IV	of an		nction. Expon	formula. Hadamar ent of convergenc			
Unit VThe range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.							
Recommended         Books       1. J.B. Conway, Functions of one complex variable, Springer-Verlage				erlag.			

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semeste	er:	II
Subject			Mathematics				
Title of the paper		Advanced Discrete Mathematics-II		Paper No : V(l) (optional)			
Medium of i (Teaching)	nstruc	tions	English		Questio English	n Paper La	anguage:
Maximum N	Iarks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.						
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions , generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.						
Unit III	deriv	ation , sen		guages , Language anguage generated rammars.			
Unit IV	state	Acceptors	,deterministic a	m & Languages de and Non-determinis Fable & Diagrams.	stic Finite	e Automat	a finite State
Unit V	Reduced machines , Kleen's Theorem (statement only )Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.( definition only )						
Recommend	led	1. J.P. McGraw	•	R. Manobar, Disc	rete mat	thematical	Structures,
Books 2. N. Dec			, Graph Theory with applications, Preritice-Hill				

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Note : Setting is to be Done Strictly From Recommended Books.



# **M.Sc. SEMESTER III**

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### Theory

Class		M.Sc / M.A.		Semester: III		
Subject		Mathematics	Mathematics			
Title of the	paper	Functional Analysis-I		Paper N	lo : I	
Medium of instructions (Teaching)		English		Questio English	n Paper La	nguage:
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.					
Unit II	nit II Normed linear subspace, equivalent norms, Ries'z lemma and compactnes quotient space of normed linear spaces and its completeness.					ompactness.
Unit III	Linear operator	r, Bounded linea	r operator and cont	tinuous o	perators.	
Unit IV	Linear function	al, bounded line	ar functional, Dual	spaces w	ith example	·S.
Unit V	<b>-</b> ,	orthogonal co of functional on	omplements, ortho Hilbert spaces.	onormal	sets and	sequences.
RecommendedWileyBooks2. G.I		Kreyszig, Introductory functional analysis with application, Jhon y & sons, New York 1978. .F. Simmous, Introductions to Topology & Modern Analysis, Tata Graw Hill, New York.				
Reference		Choudhary and Sudarshan Nanda, Functional Analysis with cations Wiley Eastern Ltd.				

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Note : Setting is to be Done Strictly From Recommended Books.

## Theory

Class			M.Sc / M.A.		Semest	Semester: III		
Subject			Mathematics					
Title of the	paper		Integral	Trans	sform-I	Paper I	No : II	
Medium of instructions (Teaching)		English		-	Question Paper Language: English			
Maximum N	Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.							
Unit II		cation to 1 nulates diff		-	uations, Applicatio ons.	n to Integ	ral equation	ns. Solution
Unit III	-	ce Equatio ve equatio		dimen	sion, Wave Equat	ion in one	dimension A	Application
Unit IV	Appli	cation of I	Laplace T	ransfo	rm to electrical cir	cuits, App	plication to I	Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.							
Books			tegral Transforms by Goyal and Gupta. tegral Transform by Sneddon.					

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

lass			M.Sc / M.A.		Semeste	er: III	
Subject			Mathematics				
Title of the paper		Advanced Gra	ph Theory-I	Paper N	lo : III		
Medium of instructions (Teaching)		English		Questio	Question Paper Language: English		
Maximum	Marks		Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Revisio	n of graj	oh theoretic pre	liminaries. Isomo	rphism of g	raphs, subg	raphs.
Unit II	compo	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.					
Unit III	· · · ·	-	· · · · ·	nnce and centers i ircuits, spanning	,		•
Unit IV		s, Prope parability		et, Fundamental	circuits and	l cut-sets, c	onnectivity
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.						
Recommended Books by N				applications to E rentice Hall of Inc rary.	0 0	and Compu	ter Science

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

Class			M.Sc / M.A.		Semest	er: III	
Subject			Mathematics				
Title of the p	paper		Operations Research-I		Paper 1	No : IV	
Medium of instructions (Teaching)		English		Questio English	on Paper Lang 1	guage:	
Maximum Marks			Total: 100	Main Exam:	70	C.C.E:	30
Unit I	Operations Research and its scope, Origin and Development of Operation Research, Characteristics of Operations Research.					perations	
Unit II		Iodel in Operations Research, Phase of Operations Research, Uses and.imitations of Operation Research, Linear Programming Problems.					
Unit III	Mathe	matical F	ormulation, Gra	aphical Solution Mo	ethod.		
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.					-	
Unit V	Duality	y, Fundar	nental propertie	es of duality and the	eorem of	duality.	
Recommend Book	led		ti Swarup, PO.K. Gupta and Manmohan, Operations Research, an Chand & Sons., New Delhi.				
2. F.S. 1 (This boo 3. G.Had			Sharma, Operation Research. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. ok comes with a CD containing software) dley, Linear Programming, Narosa Publishing House, 1995. ndley, Linear and Dynamic programming, Addison-Wesley Reading				

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# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

5. H.A. Taha, operations research- An introduction, Macmillan Publishing
Co. Inc., New York.
6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi
7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East- West Pvt.Ltd.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class			M.Sc / M.A.		Semeste	er: III	
Subject			Mathematics				
Title of the paper		Theory of Linear Operators-I		Paper No : V(l) (optional)			
Medium of instructions (Teaching)		tions	English		Questio English	n Paper La	inguage:
Maximum Marks			Total: 100	Main Exam:	70	C.C.E:	30
Unit ISpectral Theory in finite dimensional normed spaces. Regular value resolve and spectrum.					esolvent set		
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.						
Unit III				near operator on a Banach Algebras.	complex	banach spa	ace. Banach
Unit IV	Comp opera		operators on n	ormed spaces, furth	ier prope	rties of con	npact linear
Unit V	Spect	ral proper	ties of compact	linear operators.			
Recommend	led		reyszing, Introductory functional analysis with applications. Jhon Sons, New York 1978.				
Books			F. Simmons, Introduction to Topology & Modern Analysis Tata raw Hill, New York,				
			Halmos, Introctuion to Hilbert space and the theory of spectral city, socond Edition, Chelsea Publishing Co New York, 1957.				
Reference			Dund Ford and J.T. Schwartz. Linear operator-3 part inter Wile New Youk, 1958-74				
		3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.					

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Note : Setting is to be Done Strictly From Recommended Books.



# **M.Sc. SEMESTER IV**

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### Theory

Class		M.Sc / M.A.		Semeste	er: IV		
Subject		Mathematics					
Title of the	paper	Functional Analysis-II		Paper N	Jo : I		
Medium of instructions (Teaching)		English		Questio English	n Paper Language:		
Maximum N	Aarks	Total: 100	Main Exam:	70	C.C.E: 30		
Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.						
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.						
Unit III	• -		spaces, relation sive spaces, Reflexiv		adjoint operator and bert space.		
Unit IV	•••		egory theorem, uni nd weak convergen		ndedness theorem and med spaces.		
Unit V	e	f sequences of o eorem, contracti	-	ionals, oj	pen mapping theorem,		
Recommend Books	led Wiley 2. G	Kreyszig, Introductory Functional Analysis with applications, John y & Sons, New York 1978. G.F. Simmons, Introduction to Topology & Modern Analysis Fraw Hill, New York.					
Reference		Choudhary and Sudarshan Nanda, Functional Analysis with ications, Wiley Eastern Ltd.					

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Note : Setting is to be Done Strictly From Recommended Books.

## Theory

Class		M.Sc / M.A.			Semester: IV			
Subject		Mathematics						
Title of the paper Medium of instructions (Teaching)		Integral Transform-II English			Paper No : II Question Paper Language: English			
								Maximum Marks
Unit I	Fouri	ourier Transform, Infinite Fourier transform, Complex Fourier transform.						
Unit II	Finite	Finite Fourier Transform and Fourier Integral.						
Unit III		Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.						
Unit IV	Appli	Application for Fourier Transform to Boundary value problems.						
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems							
RecommendedBooks2. Int		tegral Transforms by Goyal and Gupta. tegral Transforms by I.N. Sneddon. tegral Transforms by Gupta and Vashishtha.						

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Note : Setting is to be Done Strictly From Recommended Books.

## Theory

lass		M.Sc / M.A.			Semester: IV			
Subject		Mathematics						
Title of the paper		Advanced Graph Theory-II			Paper No : III			
Medium of instructions (Teaching)		English			Question Paper Language: English			
Maximum N	Maximum Marks		Total:	100	Main Exam:	70	C.C.E:	30
Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.							
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.							
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.						Coverings,	
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.							
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.							
Recommended Books by N		ph theory with applications to Engineering and computer science Narsingh Deo. ph theory by Harary.					uter science	

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Note : Setting is to be Done Strictly From Recommended Books.

### Theory

Class		M.Sc / M.A.			Semest	Semester: IV			
Subject		Mathematics							
Title of the paper		<b>Operations Research-II</b>			Paper N	Paper No : IV			
Medium of instructions (Teaching)		English			-	Question Paper Language: English			
Maximum Marks		Total:	100	Main Exam:	70	C.C.E:	30		
Unit I	Vogel	Transportation problems: North-West Corner Method Least-Cost Method Vogel's Approximation Method, MODI Method. Exceptional cases and problem o degeneracy.							
Unit II	0	nment problems, Non-Linear Programming Techniques-Kuhn-Tucker litions, Non-negative constraints.							
Unit III	Meth	twork analysis, constraints in Network, Construction of network, Critical Path ethod(CPM) PERT, PERT calculation, Resource Leveling by Networks chniques and advances of network (PERT/CPM)							
Unit IV		Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.							
Unit V	games	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.							
Recommended		ti Swarup, P.K. Gupta and Manmohan, Operations Research, tan Chand & Sons, New Delhi.							
Reference (Thi		Sharma, Operations Research. Hiller and G.J. Lieberman, Industrial Engineering Series, 199 his book comes with a CD containing Software) adley, linear programming, Narosa Publishing House, 1995.							

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# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.

4	. G.Hadley, linear and dynamic programming, Addison- Wesley Reading
	mass.
5	. H.A. Taha, Operations Research,- An Introduction Macmillan
	Publishing.
6	. Prem Kumar Gupta and D.S. Hira, Operations Research, an
	Introduction S.Chand & Company Ltd., New Delhi.
7	. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-
	West Pvt, New Delhi, Madras.

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Note : Setting is to be Done Strictly From Recommended Books.

Theory

Class		M.Sc / M.A.		Semester: IV				
Subject		Mathematics						
Title of the paper		Theory of Linear Operators-II		Paper No : V(l) (optional)				
Medium of instructions (Teaching)		English		Question Paper Language: English				
Maximum N	Maximum Marks		Total: 100	Main Exam:	70	C.C.E: 30		
Unit I		Further spectral properties of compact linear operators, Operator Equat involving compact linear operators.						
Unit II		er theorems of Fredholm type, Bi-orthonormal system, Fredholm native, Equicontinuous sequence, compact integral operator.						
Unit III	-	ral properties of Bounded Self-Adjoint linear operators, Further Properties unded Self-Adjoint linear operators.						
Unit IV		ve operators: Product of positive operators, monotone sequences of bounded djoint operators, square roots of positive operator.						
Unit V	•	rojection Operators: Product and sum of projections. Further properties of rojections.						
Recommended Wiley &		eyszing, Introductory Functional Analysis with Application, John Sons, New York, 1978. Simmons, Introduction to Topology & Modern Analysis McGraw w York.						
Reference Multiplic 2. N.Du		Halmons, Introduction to Hilbert space and the theory of Spectral city, Second Edition, Chelsea Publishing co. Y.Y., 1957. and Ford and J.T. Schwartz, Linear operator-3 part inter Wiley, New York.						

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Note : Setting is to be Done Strictly From Recommended Books.

Papers Al Paper I Ca PaperII Equ	Title of paper gebra and Trigonometry llculus,&Differential uations	Theory	Marks C.C.E	Total	Compulsory/Optional
Paper I Ca PaperII Equ	gebra and Trigonometry			Total	Compulsory/Optional
Paper I Paper I Ca PaperII Equ	Iculus,&Differential	Theory	C.C.E	Total	
Paper I Ca PaperII Equ	Iculus,&Differential				
PaperII Equ	•				Compulsory
Paper III Veo					Compulsory
	ctor Analysis &Geometry				
	SEMI	L ESTER III			
Paper	Calculus, Differential equation& Mechanics	100	50	150	Compulsory
		ESTER IV	r	- -	
Paper	dvanced Calculus,Partial Differential Equations ,Complex Analysis & Abstract Algebra	100	50	150	Compulsory
I	SEMI	STER V			
Paper	Real Analysis, Linear Algebra , Elementary Discrete Mathematics	100	50	150	Compulsory
		ESTER VI		50	
Paper	etric Spaces, Numerical Analysis,Elementary Statistics	35	15	50	Compulsory
Paper	Internship		100		Compulsory

Scheme of examination

**Course:** 

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M.Sc. (2 Years Degree Course)

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		MESTER I			
Theory	Title of paper	Compulsory/Opt		larks	
Papers		ional	Theor	C.C	Tot
			У	.E	al
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100
Paper II	Real Analysis	Compulsory	70	30	100
Paper III	Topology-I	Compulsory	70	30	100
Paper IV	Complex Analysis-I	Compulsory	70	30	100
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory			50
	SEM	MESTER II			
Paper I	Advanced Abstract Algebra- II	Compulsory	70	30	100
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100
Paper III	Topology-II	Compulsory	70	30	100
Paper IV	Complex Analysis-II	Compulsory	70	30	100

Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100	
Paper VI	Job Oriented Project Work	Compulsory			50	
SEMESTER III						
Paper I	Functional Analysis - I	Compulsory	70	30	100	
Paper II	Integral Transforms - I	Optional	70	30	100	
Paper III	Advanced Graph Theory -I	Optional	70	30	100	
Paper IV	Operations Research-I	Optional	70	30	100	
Paper V	Theory of Linear Operators-I	Optional	70	30	100	
Paper VI	Job Oriented Project Work	Compulsory			50	
	SEM	ESTER IV		·		
Paper I	Functional Analysis - II	Compulsory	70	30	100	
Paper II	Integral Transforms - II	Optional	70	30	100	
Paper III	Advanced Graph Theory -II	Optional	70	30	100	
Paper IV	Operations Research-II	Optional	70	30	100	
Paper V	Theory of Linear Operators-II	Optional	70	30	100	
Paper VI	Comprehensive Viva-Voce	Compulsory			50	
Paper VII	Internship	Compulsory			100	

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for <i>Mathematics</i> (As recommended by Board of studies) Session: 2017-2018.					
Signature of members of B	.0.S				
	<b>Syllab</b> 2017-2018				
Semester Pattern					
Subject:	MAT	THEMATI	CS		
CONTENTS Page No.					
Under Graduate Level					
	Theory Paper	Semester I	1 3		
	,, ,,	Semester II	4 6		
	,, ,,	Semester III	7 9		
	,, ,,	Semester IV	10 12		
	,, ,,	Semester V	1315		
	,, ,,	Semester VI	16 18		
Post Graduate Level					
	Theory Paper	Semester I	19 25		
	,, ,,	Semester II	26 32		
	,, ,,	Semester III	33 38		
	,, ,,	Semester IV	39 44		

Date of submission in Autonomous Examination cell:

		Signature H.O.D.
Signature of members of B.O.S	 	





## **B.Sc. SEMESTER I**



## **B.Sc. SEMESTER II**

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal Semester Wise Syllabus for *Mathematics* (As recommended by Board of studies) Session:...... 2017-2018.



## **B.Sc. SEMESTER III**



## **B.Sc. SEMESTER IV**



## **B.Sc. SEMESTER V**



Signature of members of B.O.S ------ ------

# **B.Sc. SEMESTER VI**

Signature of members of B.O.S ------

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## **M.Sc. SEMESTER I**



**M.Sc. SEMESTER II** 



**M.Sc. SEMESTER III** 



## **M.Sc. SEMESTER IV**

Signature of members of B.O.S ------

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#### SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.)

Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies)

Session/ I= & 2017-18

### **THEORY**

Class		B.Sc.		1 <sup>st</sup> Year
Subject		Mathematics		
Title of the Paper		Algebra and Trigonometry chtxf.kr ,oa f=dks.kfefr		Paper No. First/izFke
Medium of (Teaching)	instructions	English/Hindi vaxzsth@fgUnh		Question Paper Language: English/Hindi vaxzsth@fgUnh
Maximum Mark	S	Total: <b>50</b>	Main Exam : 40	C.C.E. : <b>10</b>
Unit - 1	Rank of a matrix, Normal & Echelon from of a matrix. Characteristic equations of a matrix. Eigen values. Eigen vectors. Linear Independence of row and column matrix.			
bdkbZ&1	vkOgwg dh tkfr] vkO;wg dk izklkekU; ,oa ,s'ksykWu :i vkO;wg dk vfHkyk{kf.kd lehdj.k] vk;xsu eku] vk;xsu lfn'k iafDr ,oa LrEHk vkO;wg dh Lora=rkA			k;xsu eku] vk;xsu lfn'k]
Unit - 2	Cayley Hamilton theorem and its use in finding inverse of a matrix application of matrix to solve a system of linear (homogenous and non- homogenous) equations, theorems on consistency and inconsistency of a system of linear equations, solving linear equations upto three unknowns.			
bdkbZ&2	dsyh & gSfeYVu izes; ,oa vkO;wg dk O;qRØe vkO;wg ¼le?kkr ,oa vle?kkr½ Kkr djus esa bldk mi;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy;s vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrrk ,oa vlaxrrk ij izes;] rhu vKkr jkf'k;ksa rd ds jSf[kd lehdj.kksa ds gyA			
Unit - 3		tween the roots and coefficients of a general polynomial one variable, transformation of equations. Reciprocal equations, ale of signs.		
Signature of Members of B O S				

### Signature of Members of B.O.S.

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bdkbZ&3	,d pj ds lkekU; cgqinksa ds lehdj.k ds xq.kkadksa ,oa			
	ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k] O;qRØe			
	lehdj.k] fpUgksa dk fndkrsZ fu;eA			

## Signature of Members of B.O.S.

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Unit - 4	Logic - Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalence, Algebra of propositions. Boolean Algebra-definition and properties, switching circuits and its applications, logic gates and circuits.
bdkbZ&4	rdZ'kkL= & rdZ la;kstd] IR;rk lkj.kh] iqu:fDr vkSj O;k?kkr] rkfdZd rqY;rk] lk/;ksa dk chtxf.krA cwyh; chtxf.kr & ifjHkk"kk ,oa mlds xq.k/keZA fLopu ifjiFk ,oa mlds vuqiz;ksx] rdZ}kj ,oa ifjiFkA
Unit - 5	De- Moivre's theorem and its application, direct and inverse circular and hyperbolic functions. expansion of trignometric functions, Logarithm of complex quantities. Gregory's series, summation of trignometrical series.
bdkbZ&5	Mh & eksbolZ izes; ,ao blds vuqiz;ksx izR;{k ,oa O;qRØe o`Rrh; ,oa vfrijoyf;d QyuA f=dks.kferh; Qyuksa dk foLrkj] IfEeJ la[;kvksa dk y?kqx.kd] xzhxksjh Js.kh] f=dks.kferh; Jsf.k;ksa dk ;ksxA

#### Text Books:

- 1. S.I. Loney Plane Trigonometry Part- II
- 2. K.B. Datta Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
- 3. Chandrika Prasad A Text Book on Algebra and Theory of Equations, Pothishala Pvt.Ltd., Allahabad.
- 4. C.L. Liu Elements of Discrete Mathematics (Second Edition). MeGraw Hill, International Edition, Computer Science Series, 1986.
- 5. e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

#### **Reference Books:**

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- 1. H.S. Hall and S.R. Knight Higher Algebra H.M. Publication, 1994.
- 2. N. Jacobson Basic Algebra Vol. I and II, W.H. Freeman.
- 3. I.S. Luther and I.B.S. Passi Algebra Vol I and II, Narosa Publishing House.
- 4. N.Saran and R.S. Gupta Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad.

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#### SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE SHIVAJI NAGAR BHOPAL - 462016 (M.P.)

Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies)

Session/ **I= &** 2017-18

#### **THEORY**

Class	B.Sc.		1 <sup>st</sup> Year
Subject	Mathematics	5	
Title of the Paper	Equations	and Differential	Paper No. Second/f}rh;
Medium of instructions (Teaching)	English/Hind vaxzsth@		Question Paper Language: English/Hindi vaxzsth@fgUnh
Maximum Marks	Total: 50	Main Exam : 40	C.C.E. : 10

Unit - 1	Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.
bdkbZ&1	mRrjksRrj vodyu] yScuht izes;] eWDykfju ,oa Vsyj Js.kh esa foLrkjA vuarLi'khZA
Unit - 2	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curves in Cartesian and polar coordinates.
bdkbZ&2	oØrk] mRryrk ,oa voryrk dk ijh{k.k] ufr ifjroZu fcUnq] cgqfcUnq] dkrhZ; ,oa /kqzoh; funsZ'kkadksa esa oØksa dk vuqjs[k.kA
Unit - 3	Integration of transcendental functions, Definite Integrals, Reduction formulae Quadrature, Rectification.
bdkbZ&3	vchth; Qyksa dk vledyu] fuf'pr lekdyu] leku;u lw=] {ks=dyu,oa pkidyuA
Unit - 4	Linear differential equations and equations reducible to the linear form,

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bdkbZ&4	Exact differential equations, First order and higher degree equations solvable for x.y and p, Clairaut's equation and singular solutions, geometrical meaning of a differential equation, Orthogonal trajectories. jSf[kd vody lehdj.k ,oa jSf[kd lehdj.k esa lekusa; vody lehdj.k] ;FkkrFk vody lehdj.k] x, y vkSj b eas gy gksus ;ksX; izFke dksfV ,oa mPp /kkrh; vody lehdj.k] Dysjks dk lehdj.k vkSj fofp= gyA vody lehdj.k dk T;kferh; vFkZ] ykafcd laNsfn;kWaA
Unit - 5	Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations. Linear differential equations of second order, transformation of equations by changing the dependent variable independent variable method of variation of parameters.
bdkbZ&5	vpj xq.kkadksa okys jSf[kd vody lehdj.k] lk/kkj.k jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd vody lehdj.k] Lora= pj@ijra= pj ds ifjorZu }kjk lehdj.kksa dk :ikarj.k] izkpy fopj.k fof/kA

#### Text Books:

- 1. Gorakh Prasad Differential Calculus, Pothishala Private Ltd., Allahabad.
- 2. Gorakh Prasad Integral Calculus, Pothishala Private Ltd., Allahabad.
- 3. D.A. Murray, Introductory Course in Differential equations, Orient Longman (Indian), 1967.
- 4. e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

#### **Reference Books:**

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- 1. G.F. Simmons Differential equations, Tata McGraw Hill, 1972.
- 2. E.A. Codington An Introduction to ordinary differential equation, Prentice Hall of Indian, 1961.
- 3. H.T.H. Piaggio- Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, New Delhi 1985.
- 4. S.G. Deo- Differential Equations, Narosa Publishing House.
- 5. N.Piskunov Differential and Integral Calculus, Peace Publishers, Moscow.

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Syllabus of Mathematics for Annual Exam System (As recommended by Board of Studies)

Session/ I= & 2017-18

### **THEORY**

Class	B.Sc.		1 <sup>st</sup> Year
Subject	Mathematics		
Title of the Paper	Vector Analysis and Geometry Ifn'k fo'ys"k.k ,oa T;kfefr		Paper No. Third/r`rh;
Medium of instructions (Teaching)	English/Hindi vaxzsth@fgUnh		Question Paper Language: English/Hindi vaxzsth@fgUnh
Maximum Marks	Total: <b>50</b>	Main Exam : 40	C.C.E. : 10

Unit - 1	Scalar and vector product of three vectors, product of four vectors, Reciprocal vectors, vector differentiation. Gradient, Divergence and curl.
bdkbZ&1	rhu lfn'kksa dk vfn'k ,oa lfn'k xq.ku] pkj lfn'kksa dk xq.ku] O;qRØe lfn'k] lfn'k vodyu] xzsfM;aV] Mk;ojtsUI ,oa dyZA
Unit - 2	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them.
bdkbZ&2	lfn'k lekdyu] xkWl] xzhu ,oa LVksddh izes; ¼fcuk miifRr½ ,oa bu ij vk/kkfjr iz'uA
Unit - 3	General equation of second degree, tracing of conics, system of conies, polar equation of conic.
bdkbZ&3	f}rh; ?kkr ds O;kid lehdj.k] 'kkadoks dk vuqjs[k.k] 'kkado fudk;] 'kkado dk /kqozh; lehdj.kA
Unit - 4	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators. Right circular cone, Equation of cylinder and its properties.
bdkbZ&4	fn, x, vk/kkj ij 'kadq dk lehdj.k] 'kadq ds tud] rhu ijLij yEcor

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	tudks gsrq izfrca/k] yEco`Rrh; 'kadq] csyu dk lehdj.k vkSj blds izxq.kA
Unit - 5	Central conicoids, Paraboloids, plane sections of conicoids, Generating lines.
bdkbZ&5	dsUnzh; 'kkadot] ijoy;t] 'kkadot ds lery izPNsn] tud js[kk,saA

#### Text Books:

- 1. N. Saran and S.N. Nigam Introduction to Vector Analysis Pothishala Pvt.Ltd., Allahabad.
- 2. Gorakh Prasad and H.C. Gupta- Text Book on Coordinate Geometry, Pothishala Private Ltd., Allahabad.
- 3. N.Saran and R.S. Gupta Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad (unit IV).
- 4. e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

#### **Reference Books:**

- 1. R.J.T. Bell Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit-V).
- 2. Murray R. Spiegel Theory and Problems of Advance Calculus Sehaum Publishing Company, New Yark.
- 3. Murray R. Spiegel Vector Analysis, Sehaum Publishing Company, New Yark.
- 4. Shanti Narayan A Text Book of Vector Calculus, S.Chand & Co., New Delhi.
- 5. Shanti Narayan A Text Book of Vector Algebra, S.Chand & Co., New Delhi.
- 6. S.L. Loney The Elements of Coordinate Geometry, Macmillan and Company, London.
- 7. P.K. Jain and Khalil Ahmad A Text Book of Analytical Geometry of Two Dimensions, Macmillan Indian Ltd., 1994.
- 8. P.K. Jain and Khalil Ahmad A Text Book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1999.

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