शासकीय कमला राजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर (मध्य प्रदेश)

आनो भद्राः क्रतवो यन्तु विश्वतः

गणित विषय के अध्ययनमंडल
द्वारा अनुमोदित गणित विषय के
स्नातक एवं स्नातकोत्तर पाठ्यक्रम

अनुमोदन अकादमिक सत्र
2018–2019

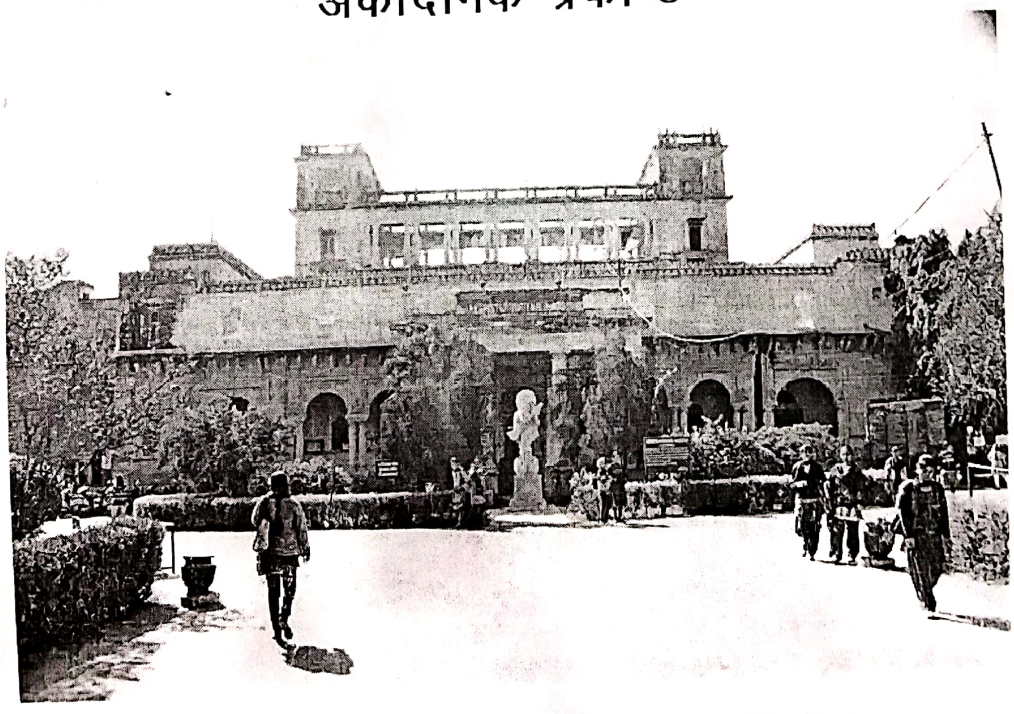
प्रस्तुतकर्ता

स्नातकोत्तर अध्ययन केन्द्र

गणित विभाग

प्राप्तकर्ता

अकादमिक प्रकोष्ठ



वेबसाइट : www.krgc.gwl.org ईमेल : krgc@rediffmail.com
दूरभाष : 0751 – 2625495, 0751 – 2438173, फैक्स : 0751 – 2625495

कार्यालय प्राचार्य, शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर
GOVT. KAMLA RAJA GIRLS P.G. AUTO. COLLEGE, GWALIOR (M.P.) INDIA

(Affiliated to Jiwaji University, Gwalior under 2(f) & 12(b) NAAC – 'A' Grade Accredited Institute)

www.krgcgwalior.org krgc@rediffmail.com Phone : 0751- 2625495, 0751-2438173

ग्वालियर, दिनांक 18 अगस्त, 2018

गणित विभाग

अध्ययन मंडल की बैठक का कार्यवाही विवरण

नवीन सत्र 2018–19 हेतु गणित विषय से सम्बंधित अध्ययन मण्डल की बैठक आज दिनांक 18 अगस्त, 2018 को प्रातः 11:00 बजे गणित विभाग में आयोजित की गई, जिसमें निम्नानुसार उपस्थिति रही –

1. डॉ. रेनु जैन, प्राध्यापक, गणित अध्ययन शाला, जीवाजी वि. वि. ग्वालियर
2. डॉ. आर.डी. मेहेकर प्राध्यापक गणित
3. डॉ. ए.बी. विचूरकर प्राध्यापक, शा. बी.आर.जी. कालेज मुरार
4. डॉ. सुनीला पाठक, प्राचार्या पी.जी.बी. कालेज, ग्वालियर
5. डॉ. आर.एन. गुप्ता प्राध्यापक-गणित, एस.एल.बी. कालेज ग्वा० 18.8.18
6. डॉ. के.वे. जैन प्राध्यापक पी.जी.बी. कालेज ग्वालियर ABSENT
7. डॉ. एम.पी. सिंह शा. एम.एल.बी. महा वि. ग्वालियर 18/08/18
8. डॉ. एन.सी. शर्मा विभागाध्यक्ष-गणित के.आर.जी. कालेज ग्वा० 18.8.18
9. डॉ. एच.पी.एस. चौहान प्राध्यापक-गणित के.आर.जी. कालेज ग्वा० 18.8.18
10. डॉ. आर.के. शर्मा प्राध्यापक-गणित के.आर.जी. कालेज ग्वा० 18.8.18
11. डॉ. बी.बी. सिंह प्राध्यापक-गणित —do— ABST
12. डॉ. एन.के. गौतम —do— 18/08/18
13. डा. के.के. शर्मा प्राध्यापक-गणित —do— 18.8
14. कु. मंजु यादव, छात्रा प्रतिनिधि : ABSENT

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही –

1. ——गणित——विषय के स्नातक स्तर के प्रथम एवं द्वितीय वर्ष का पाठ्यक्रम अंक योजना सहित सत्र 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।

2. ——गणित——विषय के स्नातक स्तर के पंचम एवं षष्ठ सेमेस्टर का पाठ्यक्रम अंक योजना सहित सत्र 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।

3. ——गणित——विषय के स्नातकोत्तर स्तर के प्रथम, द्वितीय, तृतीय, एवं चतुर्थ, सेमेस्टर का पाठ्यक्रम अंक योजना सहित सत्र 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य / ~~अथवा आंशिक संशोधन के साथ मान्य~~ किया जाता है।

4. ——गणित——विषय की सत्र 2018–2019 में होने वाली परीक्षाओं हेतु संलग्न परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।

5. विभाग में सत्र 2018–2019 में यदि कोई शोध संगोष्ठी / कार्यशाला / अधिवेशन / अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशंसा——————

6. यदि विभाग में स्ववित्तीय योजना के तहत् कोई पाठ्यक्रम/अतिरिक्त विषय/डिप्लोमा कोर्स/सर्टिफिकेट कोर्स प्रारंभ करने की योजना हो तो उसका विवरण एवं अनुशंसा।

7. यदि अन्य कोई विषय हो तो उसका विवरण एवं अनुशंसा।

हस्ताक्षर अध्ययन मंडल अध्यक्ष एवं समस्त सदस्य

18.8.18 18/08/18 18.8.18
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18.8.18 18.8.18
18.8.18 18.8

2017-2019

Mathematics **List of Examiners (2015-2017)**

S.No.	Name	Address
1.	Dr. N.C. Sharma	Prof. K.R.G. College, Gwalior
2.	Dr. R.K. Sharma	Assistant Prof. K.R.G. College, Gwalior
3.	Dr. K.K. Sharma, Registrar	Assistant Prof. K.R.G. College, Gwalior Music Univ.
4.	Dr. B.B. Singh	Assistant Prof. K.R.G. College, Gwalior
5.	Dr. N.K. Gautam	Assistant Prof. K.R.G. College, Gwalior
6.	Dr. R.K. Shrivastava	Prof. Govt. Science College, Gwalior
7.	Dr. BPS Jadon	Prof. Govt. Science College, Gwalior
8.	Dr. V.K. Gupta	Assistant Prof. Govt. Science College, Gwalior
9.	Dr. K. Kapoor	Assistant Prof. Govt. Science College, Gwalior
10.	Dr. Poonam Sinha	Assistant Prof. Govt. Science College, Gwalior
11.	Dr. (Mrs) Rajya Shri Mishra	Assistant Prof. Govt. Science College, Gwalior
12.	Dr. Prasant Dubey	Assistant Prof. Govt. Science College, Gwalior
13.	Dr. D.P. Agrawal	Assistant Prof. Govt. Science College, Gwalior
14.	Dr. Arun Tripathi	Assistant Prof. Govt. Science College, Gwalior
15.	Dr. H.S. Jatav	Assistant Prof. Govt. Science College, Gwalior
16.	Dr. R.N. Gupta	Prof. Govt. S. L. P College, Gwalior
17.	Dr. Anoop Singh Yadav	Prof. Govt. S. L. P College, Gwalior
18.	Dr. Poonam Varshney	Prof. Govt. S. L. P College, Gwalior
19.	Dr. S. N. Shukla	Prof. Govt. S. L. P College, Gwalior
20.	Dr. M. B. Sharma	Prof. Govt. S. L. P College, Gwalior
21.	Dr. H.P.S. Chauhan	Govt. P.G. College, Morena
22.	Dr. A.V. Vinchurkar	Prof, Girls college, Morar
23.	Dr. P.C. Jatav	Assistant Prof. Girls college, Morar
24.	Dr. Sunil Pathak	P.G.V. College Gwalior
25.	Dr. K.K. Jain	Prof. P.G.V. College Gwalior
26.	Prof. Pradeep Bhargava	Girls college, Shivpuri
27.	Dr.R.K. Shakya	Govt. P.G. College, Shivpuri
28.	Dr. G.D. Vaishya	Assistant Prof. P.G. College, Morena
29.	Dr. Dinesh Kumar Mishra	Assistant Prof. Govt. S. L. P College, Gwalior
30.	Dr. C.S. Yadav	Govt. college, Datia
31.	Dr. M.P. Singh	Govt. M.L.B. college, Gwalior
32.	Dr. V.K. Tiwari	Govt. college, Guna
33.	Dr. R.S. Chandel	Prof. Govt. College Geetanjali, Bhopal
34.	Dr. S.K. Malhotra	Prof. Vyapam , Bhopal
35.	Dr. Uday Dolas	Prof. Govt. P.G. College, shihor (M.P.)
36.	Dr. M.S. Rathore	Prof. Govt. College, shihor (M.P.)
37.	Dr. Narendra Kushwah	Assistant Prof. Govt. M.J.S. College, Bhind
38.	Dr. M. Kaushal	Assistant Prof. M.J.S. College, Bhind
39.	Dr. Pandey	Prof. Maharaja college , Chhatarpur (M.P.)
40.	Dr. Santosh Sharma	Prof. I.T.M. college, Gwalior
41.	Dr. Kuwar singh	Lecturer in Maths, Sagar University sagar
42.	Dr. Renu Jain	Prof. S.O.S. Jiwaji University , Gwalior (M.P.)

उच्च शिक्षा विभाग म.प्र. शासन

बी एस.सी./बी.ए. कक्षाओ के लिये वार्षिक परीक्षा पद्धति के अनुसार पाठ्यक्रम

केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित

Department Of Higher Education, Govt. of M. P.

Scheme of Examination and Syllabus for Annual Exam System

B. Sc./B.A. I Year

Academic Session : 2017-2018

Recommended by Central Board of Studies

Paper Number & Title of the Paper	Paper-wise Maximum Marks	Total Theory Marks	Minimum Passing Marks in Theory	Internal Assessment Maximum Marks.	Minimum Passing Marks in Internal Assessment	Practical Maximum Marks	Practical Passing Marks	Total
I- Algebra and Trigonometry	~~42.5~~ 40	~~127.5~~ 120	42	Ist term- (3 Months) 7.5 IInd term- (6 Months) 15 Total- ~~22.5~~ 30	8	---	---	150
II- Calculus and Differential Equations	~~42.5~~ 40							
III- Vector Analysis and Geometry	~~42.5~~ 40							

Note : There will be three sections in each paper. All questions from each section will be compulsory.

Section A (5 Marks) :This section will contain 5 objective type questions, one from each unit, with the weightage of 1 mark.

Section B (12.5 Marks) : This section will contain 5 short answer type questions (each having internal choice), one from each unit, with the weightage of 2.5 marks.

Section C (25 Marks) : This section will contain 5 long answer type questions (each having internal choice), one from each unit, with the weightage of 5 marks.

There should be 12 teaching periods per week for Mathematics like other Science Subjects

(6 Period Theory + 6 Period Practical)

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बी एससी. / बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
Department of Higher Education, Govt. of M.P.
B.Sc./B.A. Annual Examination System wise syllabus
Recommended by Central Board of studies
सत्र / Session : 2017-18

Max. Marks/अधिकतम अंक	:	~~42.5~~ 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	First/ प्रथम
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	First / प्रथम
Title/शीर्षक	:	Algebra and Trigonometry बीजगणित एव त्रिकोणमिति

Unit-1	Rank of a matrix, Normal & Echelon form of a matrix. Characteristic equations of a matrix. Eigen values. Eigen vectors. Linear Independence of row and column matrix.
ईकाई–1	आव्यूह की जाति, आव्यूह का प्रासामान्य एवं ऐसेलॉन रूप, आव्यूह का अभिलाक्षणिक समीकरण, आयगेन मान, आयगन सदिश, पंक्ति एवं स्तम्भ आव्यूह की स्वतंत्रता।
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.
ईकाई–2	केली –हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रन आव्यूह (समघात एवं असमघात) ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय के हल के लिये आव्यूह का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर प्रमेय, तीन अज्ञात राशियों तक के रैखिक समीकरणों के हल।
Unit-3	Relation between the roots and coefficients of a general polynomial equation in one variable. transformation of equations. Reciprocal equations. Descarte's rule of signs.
ईकाई–3	एक चर के सामान्य बहुपदों के समीकरण के गुणांकों एवं मूलों के बीच संबंध, समीकरणों का रूपांतरण, व्युत्क्रम समीकरण, चिन्हो का दिकार्ते नियम।
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.
ईकाई–4	तर्कशास्त्र– तर्क संयोजक, सत्यता सारणी, पुनरुक्ति और व्याघात, तार्किक तुल्यता, साध्यों का बीजगणित। बूलीय बीजगणित– परिभाषा एवं उसके गुणधर्म। स्विचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ।
Unit-5	De – Moivre's theorem and its applications. direct and inverse circular and hyperbolic functions. expansion of trignometric functions. logarithm of complex quantities. Gregory's series. summation of trignometrical series.

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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:

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. 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). McGraw Hill, International Edition, Computer Science Series, 1986.
5. म.प्र. हिन्दी ग्रंथ अकादमी की पुस्तकें।

Reference Books:

1. H.S. Hall and S.R. Knight- Higher Algebra H.M Publication, 1994.
2. N. Jocobson- 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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18.8.18

18.8.18

18/8/2018

बी.एससी. / बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
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Recommended by Central Board of studies
सत्र / Session : 2017-18

Max. Marks/अधिकतम अंक	:	~~42.5~~ 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	First / प्रथम
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	Second / द्वितीय
Title/शीर्षक	:	Calculus and Differential Equations कलन एवं अवकल समीकरण

Unit-1	Successive differentiation. Leibnitz theorem. Maclaurin's and Taylor's series expansions. Asymptotes.
ईकाई–1	उत्तरोत्तर अवकलन, लेबनीज प्रमेय, मैक्लारिन एवं टेलर श्रेणी मे विस्तार। अनंतस्पर्शी।
Unit-2	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curves in cartesian and polar coordinates.
ईकाई–2	वकता, उत्तलता एवं अवतलता का परीक्षण, नति परिवर्तन बिन्दु, बहुबिन्दु, कार्तीय एवं ध्रुवीय निर्देशांको में वक्रो का अनुरेखण।
Unit-3	Integration of transcendental functions. Definite Integrals. Reduction formulae, Quadrature. Rectification.
ईकाई–3	अवीजीय फलनों का समाकलन, निश्चित समाकलन समानयन सूत्र क्षेत्रकलन एवं चापकलन।
Unit-4	Linear differential equations and equations reducible to the linear form. 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.
ईकाई–4	रैखिक अवकल समीकरण एवं रैखिक समीकरण में समानेय अवकल समीकरण, यथातथ अवकल समीकरण, गए ल और च में हल होने योग्य प्रथन कोटि एवं उच्च धातीय अवकल

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	समीकरण, क्लेरो का समीकरण और विचित्र हल। अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदियां।
Unit-5	Linear differential equation 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.
ईकाई–5	अचर गुणांको वाले रैखिक अवकल समीकरण, साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण, स्वतंत्र चर/ परतंत्र चर के परिवर्तन द्वारा समीकरणों का रुपांतरण, प्राचल विचरण 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. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books:

1. G. F. Simmons- Differential Equations, Tata McGraw 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. Piskunov – Differential and Integral Calculus, Peace Publishers, Moscow.

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बी.एससी. / बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
Department of Higher Education, Govt. of M.P.
B.Sc./B.A. Annual Examination System wise syllabus
Recommended by Central Board of studies
सत्र / Session : 2017-18

Max. Marks/अधिकतम अंक	:	~~42.5~~ 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	First /प्रथम
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	Third / तृतीय
Title/शीर्षक	:	Vector Analysis and Geometry सदिश विश्लेषण एवं ज्यामिति

Unit-1	Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. vector differentiation. Gradient. Divergence and curl.
ईकाई–1	तीन सदिशों का अदिश एवं सदिश गुणन, चार सदिशों का गुणन, व्युत्क्रम सदिश, सदिश अवकलन, ग्रेडियट, डायवरजेन्स एवं कर्ल।
Unit-2	Vector Integration. Theorems of Gauss. Green. Stoke (without proof) and problems based on them.
ईकाई–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 conics. polar equation of a conic.
ईकाई–3	द्वितीय घात के व्यापक समीकरण, शांकवो का अनुरेखण, शांकव निकाय, शांकव का ध्रुवीय 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.
ईकाई–4	दिए गए आधार पर शंकु का समीकरण, शंकु के जनक, तीन पररपर लम्बवत जनको हेतु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का समीकरण और इसके प्रगुण।
Unit-5	Central conicoids. Paraboloids. plane sections of conicoids. Generating lines.
ईकाई–5	केन्द्रीय शांकवज, परवलयज, शांकवज के समतल प्रच्छेद, जनक रेखाऐं।

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).

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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., 1999.

18.8.18 18/08/18 18.8.18 18.8.18 18.8.18 18.8.18 18.8.18

उच्च शिक्षा विभाग म.प्र. शासन

बी.एससी./बी.ए. कक्षाओ के लिये वार्षिक परीक्षा पद्धति के अनुसार पाठ्यक्रम

केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित

Department Of Higher Education, Govt. of M. P.

Scheme of Examination and Syllabus for Annual Exam System

B. Sc./B.A. II Year

Academic Session : 2018-2019

Recommended by Central Board of Studies

Paper Number & Title of the Paper	Paper-wise Maximum Marks	Total Theory Marks	Minimum Passing Marks in Theory	Internal Assessment Maximum Marks. (30)	Minimum Passing Marks in Internal Assessment	Practical Maximum Marks	Practical Passing Marks	Total
I- Abstract Algebra	~~42.5~~ 40	~~127.5~~ 120	42	Ist term- (3 Months) 7.5 IInd term- (6 Months) 15 Total 22.5	8	---	---	150
II- Advanced calculus	~~42.5~~ 40							
III- Differential Equations	~~42.5~~ 40							

Note : There will be three sections in each paper. All questions from each section will be compulsory.

Section A (5 Marks) :This section will contain 5 objective type questions, one from each unit, with the weightage of 1 mark.

Section B (12.5 Marks) : This section will contain 5 short answer type questions (each having internal choice), one from each unit, with the weightage of 2.5 marks.

Section C (25 Marks) : This section will contain 5 long answer type questions (each having internal choice), one from each unit, with the weightage of 5 marks.

There should be 12 teaching periods per week for Mathematics like other Science Subjects

(6 Period Theory + 6 Period Practical)

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बी.एससी./बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
Department of Higher Education, Govt. of M.P.
B.Sc./B.A. Annual Examination System wise syllabus
Recommended by Central Board of studies
सत्र / Session : 2018-19

Max. Marks/अधिकतम अंक	:	42.5 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	Second /द्वितीय
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	First/प्रथम
Title/शीर्षक	:	Abstract Algebra अमूर्त बीजगणित

Unit-1	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties.
इकाई–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.
इकाई–2	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।
Unit-3	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.
इकाई–3	समूहों की समाकारिता एवं तुल्याकारिता, समाकारिता का मूलभूत प्रमेय, रूपान्तरण एवं क्रमचय समूह S_n(S_n के विभिन्न उपसमूह, संकल्पित है कि $n<5$), कैली प्रमेय।
Unit-4	Group Automorphism, Inner Automorphism, group of Automorphisms, Conjugacy relation and Centraliser, Normaliser, Counting principle and class equation of a finite group, Cauchy's theorem for finite abelian groups and non-abelian groups.

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ईकाई–4	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.
ईकाई–5	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण पूर्णाकीय प्रांत एवं क्षेत्र।)

Text Books:

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:

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. H. Freeman.
4. I. S. Luther and I. B. S. Passi- Algebra., Vol I and II, Narosa Publishing House.

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बी.एससी. / बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
Department of Higher Education, Govt. of M.P.
B.Sc./B.A. Annual Examination System wise syllabus
Recommended by Central Board of studies
सत्र / Session : 2018-19

Max. Marks/अधिकतम अंक	:	~~42.5~~ 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	Second/ द्वितीय
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	Second/द्वितीय
Title/शीर्षक	:	Advanced calculus उच्च कलन

Unit-1	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 intergral test. Cauchy's root test. ratio tests. Raabe's tests. logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence.
ईकाई–1	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, परिबद्ध एवं एकदिष्ट अनुक्रम कॉशी का 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।
Unit-2	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.
ईकाई–2	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, सतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामीतीय अर्थ, अवकलों के लिए डार्बू का मध्यवर्ती मान प्रमेय।
Unit-3	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.

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ईकाई–3	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।
Unit-4	Envelopes, Evolutes. Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.
ईकाई–4	अन्वालोर्प, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लेग्रांज के गुणांको की विधि, बीटा एवं गामा फलन।
Unit-5	Double and triple integrals. volumes and surfaces of solids of revolution Dirichlet's integrals. change of order of integration in double integrals.
ईकाई–5	द्विक एवं त्रि–समाकल, ठोस के परिभ्रमण से जनित आयतन एवं प्रष्ठ, ड्रीचलेटस् 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- 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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बी.एससी. / बी.ए. कक्षाओं के लिये वार्षिक परीक्षा प्रणाली के अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित
Department of Higher Education, Govt. of M.P.
B.Sc./B.A. Annual Examination System wise syllabus
Recommended by Central Board of studies
सत्र / Session : 2018-19

Max. Marks/अधिकतम अंक	:	~~42.5~~ 40
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	Second / द्वितीय
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	Third/तृतीय
Title/शीर्षक	:	Differential Equations अवकल समीकरण

Unit-I	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, स्थानांतर प्रमेय, रुपांतरणों 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 method. Charpit's general method.

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इकाई–4	प्रथम कोटि के आंशिक अवकल समीकरण लैग्राज 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.
इकाई–5	द्वितीय व उच्च कोटि के आंशिक अवकल समीकरण, द्वितीय कोटि के आंशिक अवकल समीकरणो का वर्गीकरण अचल गुणाकों के समघात एव असमघात समीकरण, अचर गुणाको मे समानेय आंशिक अवकल समीकरण।

Text Book:

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 Megraw 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.

18.8.18

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18.8.18

18.8.18

18.8.18

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन
स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.
Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor of M.P.
Scheme of Examination
Session- 2017–18

B.Sc./ B.A. V Semester

Recommended by central Board of studies

Name of the Paper	Theory (M.M.)	Minimum Passing Marks in Theory	C.C.E. (M.M.)	Minimum Passing Marks in C.C.E.	Practical MM	Minimum Passing Marks	Total
Linear Algebra, Numerical Analysis	125	42	25	8	---	---	150

Note: There will be three sections in the question paper. All questions from each section will be compulsory.

Section –A (20 marks.) will contain 10 objective type questions, two from each unit, with the weightage of 2 marks.

Section –B (35 marks.) will contain 5 short answer type questions (each having internal choice), one from each unit having 7 marks.

Section –C (70 marks.) will contain 5 long answer type questions (each having internal choice), one from each unit, having 14 marks.

There should be 12 teaching periods per week for Mathematics like other Science Subject .
(6 Period Theory + 6 Period Practical)

18.8.18 18/08/18 18-8-18 18.8.18 18-8-18 18-8-2018

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन
स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.
Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor of M.P.
Scheme of Examination
Session- 2017–18
Effective from Session 2016 -17

Max. Marks /अधिकतम अंक	: 125
Class/ कक्षा	: B.Sc. /B.A.
Semester/ सेमेस्टर	: V
Subject/ विषय	: Mathematics
Title / शीर्षक	: Linear Algebra, Numerical Analysis

Note: Scientific Calculator will be allowed in the examination of this paper.

Particulars/ विवरण

Unit-1	Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces, Linear span, Linear dependence, independence and their basic properties, Basis, Finite dimensional vector spaces, Existence theorem for basis, Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vector subspaces.
इकाई–1	सदिश समष्टि की परिभाषा एवं उदाहरण, उपसमष्टि, उपसमष्टियों का योग एवं सीधा योग , रैखिक विस्तृति, रैखिक आश्रितता, स्वतंत्रता एवं उनके मूल गुणधर्म, आधार, परिमित विमीय सदिश समष्टियॉं, आधार का अस्तित्व प्रमेय , आधार समुच्चय में अवयवों की संख्या की अपरिवर्तनशीलता, विमा, सदिश उपसमष्टियों के योग की विमा ।
Unit-2	Linear transformations and their representation as matrices, The algebra of linear transformations, The rank- nullity theorem, Eigen values and eigen vectors of a linear transformation, Diagonalisation, Quotient space and its dimension.
इकाई–2	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों का बीजगणित, जाति शून्यता प्रमेय , रैखिक रूपांतरणों के आयगन मान एवं आइगनसदिश विभागसमष्टि - समष्टि एवं इसकी विमा

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Unit-3	Approximations, Errors and its types, Solution of Equations: Bisection, Secant, Regula Falsi, Newton- Raphson Method and their order of convergence, Roots of second degree Polynomials, Interpolation: Lagrange interpolation, Divided Differences, Interpolation formulae using Differences and derivations of Interpolation formula.
इकाई–3	सन्निकटन, त्रुटियॉ एवं उसके प्रकार, समीकरणों के हल: द्विभाजन, सीकेन्ट, रेग्युला फाल्सी तथा न्युटन–रॉप्सन विधि एवं उसकी अभिबिन्दुता की कोटि, द्वितीय घात बहुपदों के मूल। अर्न्तवशन: लेग्रांजें अर्न्तवशन, विभाजित अन्तर, अन्तर के उपयोग से अर्न्तवशन सूत्र एवं अर्न्तवशन सूत्रों की उत्पत्ति ।
Unit-4	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.
इकाई–4	रैखिक समीकरण : रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियां ; गाउस विलोपन, गाउस जार्डन विधि, एल यू वियोजन, चोलेस्की वियोजनद्ध, पुनरावृती विधियां ; जेकोबी विधि, गाउस सिडेल विधि, रिलेक्सेशन विधि, संख्यात्मक अवकलन पर आधारित विधियां ।
Unit-5	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.
इकाई–5	साधारण अवकल समीकरण: आयलर विधि, आयलर संशोधित विधि, एकल चरण विधि, रुंग –कुटटा विधि, बहुचरण विधि, मिलने विधि, संख्यात्मक क्षेत्रकलन, न्युटन कोट्स सूत्र , गाउस क्षेत्रकलन सूत्र , संख्यात्मक समाकलन पर आधारित विधियॉ एवं उनकी उत्पत्ति ।

Text Books :

1. K. Hoffman and R. Kunze, Linear Algebra, 2nd Edition. Prentice Hall Englewood Cliffs, New Jersey, 1971

18.8.2018 18.8.18 18.8.18 18/08/18 18.8.18

2. C E Frooerg. Introduction to Numerical Analysis, (Second Edition L Addison-Wesley - 1979,
3. M K Jain, S.R.K. Iyengar, R. K. Jain. Numerical Methods Problems and Solutions, New Age International (P)Ltd. 1996.

Reference Book:-

1. E. Balaguruswamy- Numerical Method Tata Mc Graw_ Hill Pub.Com. New Yark
2. K.B. Datta. Matrix and Linear Algebra, Prentice hall of India Pvt Ltd., New Delhi, 2000.
3. S.K. Jain, A. Gunawardena & P.B. Bhattacharya. Basic Linear Algebra with MATLAB Key college Publishing (Springer-Verlag) 2001
4. S. Kumarsaran, Linear Algebra, A Geometric Approach Prentice – Hall of India.

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन
स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.
Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor of M.P.
Scheme of Examination
Session- 2017–18
Recommended by central Board of studies

Name of the Paper	Theory (M.M.)	Minimum Passing Marks in Theory	C.C.E. (M.M.)	Minimum Passing Marks in C.C.E.	Practical MM	Minimum Passing Marks	Total
Real Analysis, Discrete Mathematics and Optionals	125	42	25	8	---	---	150

Note: There will be three sections in the question paper. All questions from each section will be compulsory.

Section –A (20 marks.) will contain 10 objective type questions, two from each unit, with the weightage of 2 marks.

Section –B (35 marks.) will contain 5 short answer type questions (each having internal choice), one from each unit having 7 marks.

Section –C (70 marks.) will contain 5 long answer type questions (each having internal choice), one from each unit, having 14 marks.

There should be 12 teaching periods per week for Mathematics like other Science Subject .

(6 Period Theory + 6 Period Practical)

Optional unit should be different from the main subject/paper studied during Semester I to Semester VI

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन

स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.

Single Paper Pattern Syllabus for U.G. Classes Under Semester System

As recommended by Central Board of Studies and approved by the Governor of M.P.

Scheme of Examination

Session- 2017–18

Max. Marks / अधिकतम अंक	: 125
Class/ कक्षा	: B.Sc. /B.A.
Semester/ सेमेस्टर	: VI
Subject/ विषय	: Mathematics
Title / शीर्षक	: Real Analysis, Discrete Mathematics and Optionals
Compulsory / अनिवार्य या Optional	: Compulsory/Optional

Particulars/ विवरण

Unit-1	Riemann integral, Algebra of Riemann integrable functions, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus
इकाई–1	रीमान समाकल, रीमान समाकलनीय फलनों का बीज गणित, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूल भूत प्रमेय , समाकलनों के माध्यमान प्रमेय ।
Unit-2	Definition and examples of metric spaces, Neighbourhoods, Limit points, Interior points, Open 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.
इकाई–2	दूरीक समष्टि की परिभाषा एवं उदाहरण, सामीप्य, सीमा बिन्दु, अंत : बिन्दु, विवृत्त एवं संवृत समुच्चय, संवरणक एवं अभ्यंतर, परिसीमा बिन्दु, दूरीक समष्टि की उप समष्टि, कौशी अनुकम, पूर्णता, केन्टर का सर्वनिष्ठ प्रमेय , संकुचन सिद्धांत , पूर्ण कमित क्षेत्र के रूप में वास्तविक संख्यायें, सतत फलन की परिभाषा एवं उसके उदाहरण।

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Unit-3	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.
इकाई–3	तर्क का बीज गणित, पुनरुक्तियों तथा विरोध का पुनरावलोकन, तार्किक तुल्यता, साध्यों का बीजगणित, प्रमात्रीकारकः आस्तित्व प्रमात्रीकारक एवं सर्व प्रमात्रीकारक, बूलीय बीजगणित एवं उसके गुणधर्म, डी–मार्गन नियम, वैद्युत परिपथों का बीजगणित एवं उनके अनुप्रयोग ।
Unit-4	Boolean Function, Disjunction and Conjunction Normal Forms, Bools Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial Order Relation.
इकाई–4	बूलीय फलन, वियोजनीय एवं संयोजनीय प्रसामान्य रूप, बूल का प्रसार प्रमेय द्विचर संबंध, तुल्यता संबंध, विभाजन एवं आंशिक क्रम संबंध।
Optional **This unit should be different from the main subject/paper studied during Semester I to Semester VI.**	
Graph Theory	
Unit-5	Graphs, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths: Dijkstra's Algorithm, Matrix Representation of Graph: Incidence and Adjacency Matrix, Trees and its simple properties.
इकाई–5	ग्राफ, बहुग्राफ, भारित ग्राफ, पथ एवं परिपथ, लघुतम पथ : डाइजक्स्त्रा एल्गोरिथम, ग्राफ का आव्यूह निरूपणः इन्सीडेंस एवं एडजेसेन्सी आव्यूह , वृक्ष एवं उसके सामान्य गुणधर्म।
Or/ अथवा	
Elementary Statistics	
Unit-5	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 functions, Theoretical distribution: Binomial, Poisson distributions and their properties and uses.
इकाई–5	प्रायिकता, सतत प्रायिकता, प्रायिकता घनत्व फलन तथा उनके अनुपयोग (सतत प्रायिकता बंटन के लिये माध्य, बहुलक माध्यिका तथा मानक विचलन ज्ञात करने

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	के लिये) गणितीय प्रत्याशा, यादृच्छिक चरों के योग एवं गुणन की प्रत्याशा, आघूर्ण जनक फलन, सैद्धांतिक बंटन: द्विपद, पॉयजन बंटन तथा उसके गुणधर्म एवं उपयोग ।
Or/ अथवा	
PRINCIPLES OF COMPUTER SCIENCE	
Unit-5	Data Storage of bits Ram Memory. Mass storage. Coding Information of Storage. The Binary System Storing integers fractions, communication errors. Data Manipulation – The Central Processing Unit The Store Program concept. Programme Execution, Anthmetic/Logic Instruction. Computer-Peripheral Communication. Operation System : The Evolution of Operating System. (Dos, Window) Operating System Architecture. Coordinating the Machine's Activities. Other Architectures.
इकाई–5	बीटों का डेटास्टोरेज , रैम स्मृति। वृहद भण्डारण की कटू कृत सूचना। बायनरी सिस्टम। पूर्णाक, भिन्नाक का भण्डारण, संचारण त्रुटियां डाटा मेन्यूपूलेशन – सेन्ट्रल प्रोसेसिंग यूनिट, भण्डारित प्रोग्राम अभिधारणा। प्रोग्राम का संचालन। गणितीय/तार्किक निर्देश। कम्प्यूटर–सह उपकरण (पेरीफेरल्स) के मध्य संचार। ऑपरेटिंग सिस्टम: का उद्भव (Dos, Window) आपरेटिंग सिस्टम आर्किटेक्चर कम्प्यूटर मशीन की गतिविधियों का समन्वयन। अन्य आकिर्टेक्चर।
Or/ अथवा	
MATHEMATICAL MODELING	
Unit-5	The process of Applied Mathematics. Setting up first order differential equations. Qualitative solution sketching. Stability of solutions. Difference and differential equation models of growth and decay. Single species population model, Exponential and logistic population models.
इकाई–5	प्रयुक्त गणित की विधि। प्रथम कोटि अवकल समीकरण की स्थापना। गुणात्मक हल चित्रण। हलो का स्थायित्व। अंतर एवं अवकल समीकरण मॉडल विकास एवं श्रय। एकल एपाइसेस पॉपूलेशन मॉडल, एक्सापोनेंशियल एवं लॉजिस्टिक पॉपूलेशन मॉडल्स

Text Books :

1. R.R Goldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970.
2. G.F. Simmons. Introduction to Topology and Modem Analysis, McGraw-Hill

18.8.18 18.8.18 18.8.18 18.8.18 18.8.18

3. T.M Apostol, Mathematical Analysis. Norosa Publishing House. New Delhi, I
4. C.L. Liu,Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science scries 1986.
5. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. T.M Apostol, Mathematical Analysis. Norosa Publishing House. New Delhi, 1985.
2. S. Lang. Undergraduate Analysis, Springer-Veriag, New York, 1983.
3. D. Somasundaram and B. Choudhary, A first Course in Mathematical Analysis. Narosa Publishing House, New Delhi 1997.
4. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. Delhi.
5. RK. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi 2000.
6. P.K. Jain and K. Ahmed Metric Spaces, Narosa Publishing House, New Delhi, 1996.
7. S. Lang, Undergraduate Analysis, Springer-Verlag, New York 1983.
8. E.T. Copson, Metric Spaces, Cambridge University Press, 1968
9. S. Lang. Undergraduate Analysis, Springer-Veriag, New York, 1983.

Optional Papers

1. Graph Theory

Text Book:

1. Narsingh Deo : Graph Theory, McGraw Hill.
2. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें ।

2. Elementary Statistics

Text Book:

1. Statistics by M. Ray
2. Mathematical Statistics by J.N Kapoor, H.C Saxena (S. Chand)
3. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें ।

References Book:

1. Fundamentals of Mathematical Statistics, Kapooor and Gupta

3. Principles of Computer Science

Text Book:

1. J. Glen Brokkshear, Computer Science: An Overview, Addition- Wesley.
[illegible] 3rd Edition). Addision- Wesley

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Total at least ten practicals

3. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें ।

4. Mathemetical Modeling

Text Book:

1. Kapoor, J.N. : Mathematical models in Biology and Medicine. EWP (1985)
2. SAXENA V.P. : Bio-Mathematical an introduction, M.P. Hindu Growth Aradamy 1993
3. Martin Braun C.S. Coleman, DA Drew (Eds.) Differential Equation Models.
4. Steven J.B. Lucas W.P., Straffin B.D. (Eds.) Political and Related Models, Vol.2
5. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Book:

1. Cullen Linen Models in Biology.
2. Rubinoe, SI : Introduction yo Mathematical Biology. John Wiley and Sons

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Govt. Kamla Raja Girls Post Graduate (Autonomous) College,

Gwalior, M.P.

M.Sc. (Mathematics) Session ~~2015-16~~ 2017-18 2018-19

Scheme

Session- Nov-Dec-~~2015~~ 2018

Semester I

Paper No.	Paper code and Title	Marks
First Paper	Advanced Abstract Algebra	85 Ext+15 CCE = 100
Second Paper	Analysis	85 Ext+15 CCE = 100
Third Paper	Integral Transform	85 Ext+15 CCE = 100
Fourth Paper	Computer Fundamental and Programming 'c'	85 Ext+15 CCE = 100
Practical	Lab: Practical with Programming In C	100

Session – April – May – ~~2016~~ ~~2018~~ 2019

Semester II

Paper No.	Paper code and Title	Marks
First Paper	Complex Analysis	85 Ext+15 CCE = 100
Second Paper	Differential Equations	85 Ext+15 CCE = 100
Third Paper	Topology	85 Ext+15 CCE = 100
Fourth Paper	Numerical Method	85 Ext+15 CCE = 100
Practical	Lab : Practical with Programming In C++	100

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Govt. Kamla Raja Girls Post Graduate (Autonomous) College,

Gwalior, M.P.

M.Sc. (Mathematics) Session ~~2015-16~~ ~~2017-18~~ 2017-18 / 2018-19

Scheme

Session- Nov-Dec-~~2015~~ ~~2017~~ 2018/19

Semester III

Paper No.	Paper code and Title	Marks
First Paper	Functional Analysis	85 Ext+15 CCE = 100
Second Paper	Integral Equations and boundary value problem	85 Ext+15 CCE = 100
Third Paper	Operation Research	85 Ext+15 CCE = 100
Fourth Paper	Advanced Numerical Methods	85 Ext+15 CCE = 100
Fifth	Practical Lab: Practical based on Numerical Methods	100

Session – April – May – ~~2016~~ 2018

Semester IV

Paper No.	Paper code and Title	Marks
First Paper	Partial Differential Equations	85 Ext+15 CCE = 100
Second Paper	Advanced Graph Theory	85 Ext+15 CCE = 100
Third Paper	Discrete Mathematical Structures	85 Ext+15 CCE = 100
Fourth Paper	Special Functions	85 Ext+15 CCE = 100
Fifth	Internship / Project	100

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. I Semester

Nov-Dec ~~2015~~ ~~2017~~ 2018

Subject Mathematics

Paper I

Marks- (85, 15)

ADVANCED ABSTRACT ALGEBRA

Unit- I

Sylows First, Second and Third theorems, p-sylow Subgroups, Double cosets conjugate groups, Normal and Subnormal series, Composition series, Jordan Holder theorem, Solvable groups, and commutator subgroups.

Unit- II

Modules, Cyclic modules, Simple modules, finitely generated modules, Fundamental structure theorem for finitely generated modules.

Unit- III

Field theory, Extension fields, Algebraic Extensions, Roots of polynomials, Simple extension, Splitting fields.

Unit- IV

Elements of Galosis theory, Fixed Fields, Normal extensions, Group of automorphisms, Galosis group, Fundamental theorem of Galois theory.

Unit- V

Canonical forms, Similarity of Linear Transformations, Invariant Subspaces, Nilpotent transformations, Reduction of triangular form, Invariants, Jordon blocks & Jordon normal forms.

Text Books:

1. Topics in Algebra by I.N. Herstein, Wiley Eastern Ltd. New Delhi, 1975.
2. Basic Abstract Algebra (2nd Edition), Cambridge University Press, Indian Edition, 1997.
3. Algebra by M. Artin, Prentice-Hall of India 1991.

Reference Books:

1. Algebra by P.M. Cohn, Vols. I, II & III, John Wiley & Sons, 1982, 1989, 1991.
2. Basic Algebra, Vols. I & II by N. Jacobson, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Galois Theory by J.P. Escofier, GTM, Vol.204, Springer, 2001.
4. Lectures on Modules and Rings by T.Y. I am GTM Vol, 1990.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. I Semester
Subject Mathematics

Nov-Dec ~~2015~~ ~~2017~~ 2018
Paper II
Marks- (85, 15)

ANALYSIS

Unit- I

Metric spaces: compact sets, perfect sets, connected sets, Compactness and completeness, limit and continuity of function defined on metric spaces, limits of functions, continuous functions.

Unit- II

Continuity and Compactness, continuity and connectedness, monotonic functions: definition and existence of Riemann – Stieltjes integral, properties of the integral, integration and differentiation, the fundamental theorem of calculus, integration of vector-valued fuctions.

Unit- III

Sequence & Series of function point wise & uniform Convergence, Cauchy Criterion for uniform convergence, Weierstrass M- Test uniform Convergence of Series, Uniform Convergence & differentiation, Weierstrass approximation theorem.

Unit- IV

Lebesgue outer measure, measurable sets & its properties, Borel set & their measurability, Non-measurable set, measurable functions, characteristics function & simple function.

Unit- V

Lebesgue integral of bounded function over a set of finite measure, Integration of Non-negative function, The general Lebesgue integral, Monotonic Convergence theorem, Lebesgue convergence theorem, Fatou's Lemma.

Text Books:

1. Principles of Mathematical Analysis by Walter Rudin.
2. Real Analysis (UNIT IV & V) by H. L. Roydon.

Reference Books:

1. Mathematical Analysis by Mullick & Arora, New Age International Publisher.
2. Lebsegue Measure & Integration by Jain & Gupta. New Age International.

Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. I Semester

Nov-Dec ~~2015~~ ~~2017~~ 2018

Subject Mathematics

Paper III

Marks- (85, 15)

Integral Transforms

Unit- I

Laplace Transforms, Properties of Laplace Transforms, Laplace Transform of the derivatives of function, Inverse Laplace transform, Properties of inverse Laplace transform, Inverse Laplace transform of derivatives, convolution theorem, Heaviside's expansion theorem.

Unit- II

Application of Laplace Transform to solution of differential equations; solutions of initial value problems, solution of differential equations with constant coefficients, Solution of system of two simultaneous differential equations, Application of Laplace Transform to the solution of integral equations with convolution type kernel.

Unit- III

Applications of Laplace Transform to the solution of initial-boundary value problems-: solution of Heat equation, solution of wave equation. Solution of Laplace equation.

Unit- IV

Fourier Transforms, Fourier sine transform, Fourier cosine transform, inverse Fourier Transform, Inverse Fourier sine Transform, Inverse Fourier cosine Transform, Properties of Fourier Transforms, Modulation theorem, Convolution theorem, Fourier Transform of the derivatives of functions, Parseval's identity.

Unit-V

Application of Fourier Transforms to the solution of initial- boundary value problems-: solutions of Heat equation, solution of diffusion equation, solution of wave equation, solution of Laplace equation.

Text Books:

1. Integral Transforms by Vashishtha and Gupta.

Reference Books:

1. Integral Transforms by Sneddon.
2. Integral Transforms by Goyal & Gupta

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. I Semester

Nov-Dec ~~2015~~ ~~2017~~ 2018

Subject Mathematics

Paper IV

Marks- (85, 15)

COMPUTER FUNDAMENTAL AND PROGRAMINGIN C

UNIT- I

An overview of functioning of a computer system, Components of a computer system, I/O and auxiliary storage devices, machine and high level languages, assembler compiler and interpreters, flow charts and pseudo codes, Basic concepts of operating system.

UNIT- II

Introduction to C Essentials – Programs development, Functions, Anatomy of a function, variable and constants expressions. Assignment Statements, Scalar Data types – Declarations, Different types of integer Constants Floating – point type Initialization, mixing types Explicit conversions – casts Enumeration types the void data type, type definitions.

UNIT-III

Operators and expression in C-Precedence and associativity, control flow statements conditional branching, the switch statements, looping, nested loops, the break and continue statement, the go to statement, infinite loops.

UNIT- IV

Arrays and multidimensional arrays, storage classes – fixed vs. automatic duration scope, global variable the register specifier, functions – user defined and library function, Introduction to pointers, structures and unions.

UNIT-V

Introduction to C++: Declaration & Definition of Variables, Data Types, Operators, OOPS Fundamentals: OOPS Versus procedural programming, OOPS terminology, Data abstraction, Data hiding, Encapsulation, Class, Object, Inheritance, Polymorphism.

Text Books:

1. Computer fundamental by Rajaraman
2. Operating systems concepts by Peterson
3. Programming in ANSI C by E. Balaguruswamy, Tata-MCGraw Hill, New Delhi.
4. Programming in C++ by E. Balaguruswamy, Tata-McGraw Hill, New Delhi.
5. Schaum's outline series.

Reference Books:

1. Let us C by Y. Kanetkar.
2. Brain W Kernigham & Dennis M Ritchie the C Programmed language 2nd edition (ANSI features) Prentice Hall 1989.

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M.Sc. Exam May/June-2015
Second/Fourth Semester
Pages (01) to (05)

April-May : 2019

SS-326-A

Semester-II

Math 201

COMPLEX ANALYSIS

Paper-I

April-May : 2016/2017 2018

Unit-I

Functions of Complex Variables, Limit and Continuity Differentiability, Power Series as an Analytic Function, Exponential and Trigonometric Functions, Complex Logarithms, Zeros of Analytic Functions.

Unit-II

Complex Integration, Curves in the Complex Plane, Basic Properties of Complex Integral, Winding Number of a Curve, Cauchy – Goursat Theorem, Cauchy's Integral formula, Morera's Theorem, Laurent's Series.

Unit-III

Maximum Modulus Principle, Schwarz Lemma, Bilinear Transformations, Mobius Transformation, Cross Ratio, Fixed Point, Conformal Mapping, Liouville's Theorem.

Unit-IV

Isolated and Non-isolated Singularities, Removable Singularity, Poles, Singularity at Infinity, Calculus of Residues, Residue at Finite Point, Residue at the Point at Infinity, Residue Theorem, Number of Zeros and Poles, Rouche's Theorem, Hurwitz's theorem.

Unit-V

Evaluation of Certain Integrals, Integrals of Type $\int_{\alpha}^{2\pi+\alpha} R(\cos\theta, \sin\theta)d\theta$, Integrals of Type $\int_{-\infty}^{\infty} f(x)dx$, Integrals of Type $\int_{-\infty}^{\infty} g(x)\cos mx\, dx$, Singularities on Real Axis.

Text Book:

1. Foundation of Complex Analysis by S. Ponnusamy, Narosa Publishing House, 1997.

Reference Books:

1. Introduction to Complex Analysis by H.A. Priestly, Clarendon Press, Oxford, 1990.
2. Function of one Complex Variable by J.B. Conway, Springer-Verlag. International student-Edition, Narosa Publishing House, 1980.
3. Complex Analysis by L.V. Ahlfors, McGraw-Hill, 1979.
4. Real and Complex Analysis by Walter Rudin, McGraw-Hill Book Co., 1966
5. Complex Analysis by Brijendra Singh, V. Karanjgaonkar and Chandel

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Govt. K.R.G. P.G. (Auto) College, Gwalior

April-May ~~2018~~ 2019
~~Nov-Dec 2015~~

M. Sc. II Semester

Paper II

Subject Mathematics

Marks- (85, 15)

DIFFERENTIAL EQUATIONS

Unit- I

Preliminaries- Initial value problem and the equivalent integral equation, system of first order ordinary differential equations, concepts of local existence, Existence and uniqueness of solutions of scalar differential Equations, Peano's existence theorem and corollary and scalar case.

Unit- II

System of differential equations, Basic Theorems- Ascoli Arzela theorem, a theorem on convergence of solutions of a family of initial value problems. Picard- Lindel of theorem- Peano's existence theorem and corollary for vector.

Unit- III

Differential Inequalities and integral inequalities- Gronwall's inequality Maximal and Minimal solutions, Differential inequalities Lower and upper function.

Unit- IV

Linear systems of differential equation, characteristic polynomials eigen values, eigen vactors linear homogenous systems and their properties, wrondkian, fundamental matrix, Abel-Liouville formula, periodic linear system and Floguel's theorem, Inhomogenous linear systems and variation of constants formula.

Unit- V

Poin care- Bendixson Theory- Autonomous systems, Poin care- Bendixson theorem stability of periodic solutions, foci, nodes and saddle points.

Autonomous system of ordinary differential equations, Phase Plane, critical points, stability, Critical Points and Stability of linear systems, Stability by Liapunov's direct method, Lyapunov functions.

Text Book:

1. Ordinary Differential Equations by M. Ram Mohana Rao, East- West Press.

Reference Books:

1. Ordinary Differential Equations by P. Hartman, John wiley.
2. Theory of ordinary Differential Equations by E.A. Coddington and dSN. Levinson, Mc Graw-Hill, Ny.
3. Differential equations with applications and historical note by G.F. Simmons, Tata McGraw Hill.
4. Ordinary differential Equations by W.T. Reid. John Wiley & sons.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

April-May: ~~2018~~ 2019
~~Nov-Dec 2015~~

M. Sc. II Semester

Subject Mathematics

Paper III

Marks- (85, 15)

TOPOLOGY

Unit- I

Topological Spaces: Definition and examples, Open Sets, Closed Sets, Closure neighborhoods, Interior, exterior and boundary, Limit points and derived sets, Basis and Sub basis, Alternate method of defining a topology in terms of Kuratowski Closure operator and Neighborhood systems.

Unit- II

Continuous functions and homeomorphism, Count Ability, First and Second countable Spaces, Lindel of theorem, Separable Spaces, Second count ability and Separability, The product and box topology.

Unit- III

Connected Spaces, Connected Sets in the real line, Components, Path components, local connectedness, Path connectedness, Local Path connectedness.

Unit- IV

Compact Spaces, Lebesgue number lemma, Uniform continuity theorem, Limit point compactness, Local compactness and sequential compactness, one point compactification.

Unit- V

Separation axioms, Hausdroff, Regular and Normal Spaces, The Urysohn lemma, Tietze extension theorem, The Uryshon metrization theorem, Completely regular spaces.

Text Books:

1. Introduction to Topology and Modern Analysis by G.F. Simonons McGraw Hill Book Co.

Reference Book:

1. Topology a first course by James R Munkres, Prentice Hall of India, Pvt. Ltd. New Delhi 2000.
2. General Topology by J.L. Kelley, Van Nostrand, Reinhold Co. New York.

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April-May: ~~2018~~ 2019

~~Nov-Dec 2015~~

M. Sc. II Semester

Subject Mathematics

Paper IV

Marks- (85, 15)

NUMERICAL METHODS

Unit- I

Solution of Algebraic Transcendental & Polynomial equations: Bisection method, Iteration method on first-degree equation: Secant method, Regula-Falsi method, Newton-Raphson method, rate of convergence of Newton-Rapson method & Secant method.

Unit- II

System of linear algebraic equations: Gauss Elimination method, Gauss- Jordan Elimination method, Cholesky method, Iteration methods: Jacobi Iteration method, Gauss-Seidel method.

Unit- III

Interpolation & approximation finite difference operators, Newton's forward and backward interpolation, Central difference interpolation, Lagrange's interpolation, Newton Dividend Difference interpolation, Hermite interpolation, Spline interpolation.

Unit- IV

Differentiation and integration: Numerical differentiation, Numerical integration, Newton-cotes formula, Trapezoidal rule, Simpson's one-third rule, Gauss-Legendre integration method, Lobatto integration method, Rsadau integration method.

Unit- V

Ordinary differential equations- Euler method, Backward Euler method, Midpoint method, Taylor Series method, Runge-Kutta methods, Precdictor-Corrector methods.

Text Books:

1. Numerical method for scientific & Engineering Computation by M.K. Jain & R. K. Lyenger & R.K. Jain-Wiley Eastern Ltd.
2. Numerical Method by S.S. Sastry.

Reference Books:

1. Numerical Methods by V. RajaRaman, PHI.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. III Semester

Subject Mathematics

Nov-Dec 2015 ~~2017~~ 2018

Paper I

Marks- (85, 15)

FUNCTIONAL ANALYSIS

Unit- I

Nor med linear spaces, Banach spaces and examples, quotient space of nor med linear spaces and its completeness, convex sets and convex functional, lower semi-continuous and upper semi-continuous functions.

Unit- II

Equivalent norms, Riesz lemma, basic properties of finite dimensional nor med linear spaces and compactness. Nor med linear spaces of bounded linear transformations dual spaces with examples.

Unit- III

Uniform boundedness theorem and some of its consequences open mapping and closed graph theorems Hahn-Banach theorem for real linear spaces and complex linear spaces.

Unit- IV

Reflective spaces, Reflexivity of Hilbert spaces, Inner product spaces, Hillbert spaces. Orthonormal sets, Bessel's inequality, Complete orthonormal sets and Parseval's identity, Structure of Hillbert Spaces, Projection theorem.

Unit-V

Riesz representation theorem, Adjoint of an operator on a Hillbert space. Self-adjoint operators, Positive Projection, normal and unitary operators, Introduction to Sobolev spaces. Fundamental theorem of variational calculus, bilinear forms.

Text Books:

1. Functional Analysis with Applications by A.H. Siddique, Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Introductory Functional analysis with Applications by Kreyszig John Wiley and Sons, New York.

Reference Books:

1. Real Analysis by H.L. Royden Macmillan Publishing Co. New York, 4th Edition, 1993.
2. Functional Analysis by B.V. Limaye Wiley Eastern Ltd.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. III Semester

Nov-Dec 2015 / 2016 / 2017 / 2018

Subject Mathematics

Paper II

Marks- (85, 15)

INTEGRAL EQUATIONS AND BOUNDARY VALUE PROBLEMS

Unit- I

Definitions of integral equations and their classification, solution of integral equation, Fredholm integral equations of second kind with separable kernals, solutions of Fredholm integral equation with separable kernel method of successive approximations.

Unit- II

Method of successive substitutions, Iterative scheme for Fredholm integral equations of the second kind, resolvent: kernel and its results, application of iterative scheme to Volterra integral equations of the second kind.

Unit- III

Conversion of initial value problem to voterra integral equation and conversion of boundary value problem to Fredholm integral equation. Conversion of Fredholm integral equation to boundary value problems and conversion of Volterra integral equation to initial value problem.

Unit- IV

Orthonormal system of functions symmetric kernels, fundamental properties of Eigen values and Eigen functions. Green's function for symmetric kernels, Hilbert Schmidt theory and solutions of Fredholm integral equations with symmetric kernels.

Unit-V

Definition of a boundary value problem for an ordinary differential equation of the second order, Dirac delta function, Green's function, Green's function approach to reduce boundary value problems of differential equation with homogeneous boundary conditions to integral equations. ~~conditions to integral equations.~~

Text Books:

1. Linear Integral Equation Theory and Techniques by R.P. Kanwal Academic Press, New Yo 1971.
2. Linear Integral Equation (translated from Russian) by S.G. Mikhlin, Hindustan book Agency, 1960.

Reference Books:

1. Boundary value problems of Mathematical Physics by L. Stakgold, Vol. I, II, Mac Miillan, 19

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. III Semester

Subject Mathematics

Nov-Dec ~~2015~~ — 2018

Paper III

Marks- (85, 15)

OPERATIONS RESEARCH

Unit- I

Introduction, Nature and Meaning of O.R. Modeling in operations Research. Features of operation research, scope of operations research Linear Programming Problem: formulation of L.P.P. solution of L.P.P. Graphical Method, Simplex Methods in Duality, Integer Programming.

Unit- II

Assignment problems: Mathematical formulation, reduction theorem, unbalanced assignment problem. Transportation problem formulation basic feasible solution North-West-Corner method. Least cost method, Vogel's Approximation method. Optimum solution: MODI method.

Unit- III

Job sequencing: Processing in jobs through 2 machines. Processing in jobs through 2 machines, Processing 2 jobs through a machine. Replacement problems: Replacement policy for items whose maintenance cost increase with time and money value is constant. Money value changes with constant rate.

Unit- IV

Project management: Introduction, network diagram representation, time estimates and critical path with saddle point, rectangular game without saddle point, Principle of dominance, Graphical method.

Unit- V

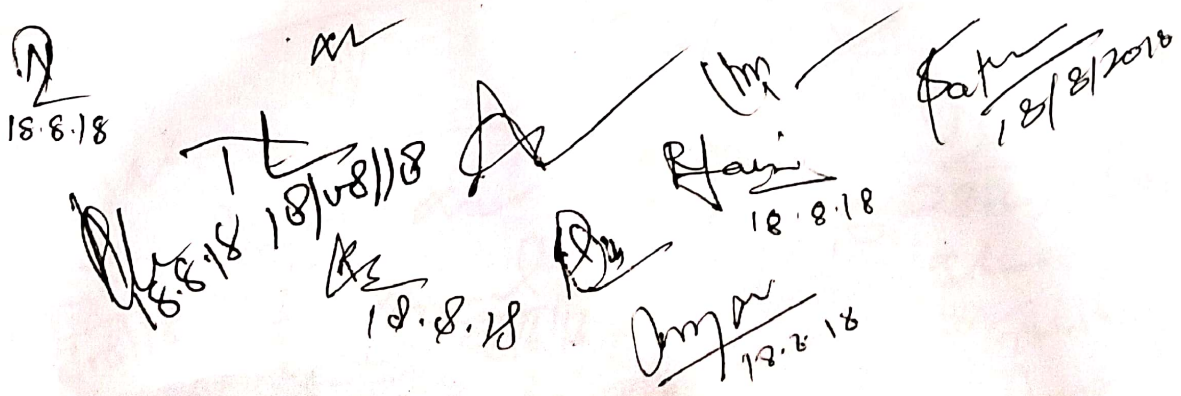
Queuing Theory: Introduction, queuing system, Transient and steady traffic inlets, Distribution of arrival distribution of departure. M/M/L viz. FCFS model nonlinear programming: Kuhn-Fueker conditions.

Text Books:

1. Linear Programming by G. Hadley, Narosa Publishing House, 1995.
2. Operations Research by R.K. Gupta.

Reference Books:

1. Introduction to Operations Research (sixth edition) by F.S. Hillier and G.J. Lieberman Mc Graw Hill International Edition, Industrial Engineering Series 1995.
2. Operations Research by S.D. Sharma.



Nov : 2018
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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. III Semester

Nov-Dec 2015 / 2016

Subject Mathematics

Paper IV

Marks- (85, 15)

ADVANCED NUMERICAL METHODS

Unit- I

Introduction difference calculus, difference operator, linear difference equations, first order equations general results for linear equations. Equations with constant coefficients equations with variable coefficients.

Unit- II

Classification of partial differential equations, Dirichlet's problem, Cauchy's problem. Finite difference approximations to partial derivatives, Elliptic equation, Numerical solutions of Laplace and Poisson equations, Solution to elliptic equations by relaxation method, solution by Laplace equation by Alternating Direction Implicit (ADI) method.

Unit- III

Parabolic equations, Numerical solution of one dimensional diffusion & heat equations. Schmidt method, Crank-Nicholson method, Iterative method-Dafort and Frakel method.

Unit- IV

Hyperbolic equations, the one dimensional wave equation, Numerical solutions of one-dimensional wave equation, Numerical solution of one dimensional wave equation by difference schemes, central-difference schemes, ~~central difference schemes~~, D'Alembert solution.

Unit-V

Variational finite element method with application to one-dimensional problem, solution of time dependent problems in one dimension and two dimension & steady state problem using Ritz's method.

Text Books:

1. Difference Equation- An Introduction with Appliction by Walter G. Kelley and Allen C. Peterson, Academic Press Inc,. Harcourt Brace Joranovich Publishers, 1991.
2. Numerical solutions of Differential Equations by M.K. Jain, New Age International (P) Limited, Publishers.

Reference Books:

1. Applied Numerical Analysis by Gerald & Wheatley, Pearson Education.

Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. IV Semester

Subject Mathematics

Nov-Dec 2015

Paper I

Marks- (85, 15)

Apr-May : 2019

PARTIAL DIFFERENTIAL EQUATIONS

Unit-I

Introduction, Classifiction of second order Partial Differential Equations (PDE), Canonical Forms, Boundary Value Problems (BVPS), Properties of Harmonic Functions, Separation of variables

Unit- II

Eiliptic Differential Equations, Laplace Equations, Poisson Equations. Drichled Problem for a Rectangle. The Neumann Problem for a Rectangle, Interior Drichlet Problem for a Circle, Exterior Drichlet Problem for a Circle, Interior Neumann problem for a circle. Solution of Laplace Equation in Cylindrical Coordinates, solution of Larlace Equation in Spherical Coordinates.

Unit-III

Parabolic Differential Equations Diffusion Equations Heat Equations Occurrence of Diffusion Equation, Boundary Conditions, Elementary Solutions of the Diffusion Equation, Dirac Delta Function, Separation of Variables Method Solution of Diffusion Equation in Cylindrical Coordinates, Solution of Diffusion Equation in Spherical Coordinates.

Unit- IV

Hyperbolic Differential Equations Wave Equations, Occurrence of the Wave Equation, Solution of one Dimensional Wave Equation by Canonical Reduction, the initial value problems: D' Alembert Solution, Vibrating String Variables Separable Solution, Forced Vibrations- Solution of Non homogenous Equations.

Unit-V

Duhamel's Principle, Green's Function, Green's Function For Laplace Equation, The method of Images. Green's Function for the Wave Equation-Helmholtz Theorem, Green's Function for the Diffusion Equation.

Books Recommended:

1. Introduction to Partial Differential Equations by K. Sankara Rao, PHI.

Reference Books:

1. Elements of Partial Differential Functions by I.N. Sneddon Mc Graw Hill

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Govt. K.R.G. P.G. (Auto) College, Gwalior

April-May : ~~2018~~ 2019

M. Sc. IV Semester

~~Nov-Dec 2015~~

Subject Mathematics

Paper II

Marks- (85, 15)

ADVANCED GRAPH THEORY

Unit- I

Revision of graph theoretic preliminaries, Operations on graphs, Graph Isomorphism disconnected graph and their Components. Traveling salesman problem, round table problem, Konisberg Bridge problem, Eulerian and Hamiltonian Paths and circuits.

Unit- II

Properties of trees, Distance, centre, radius, diameter eccentricity and related theorems, Graph as a metric space, Rooted and binary trees, Labeled graph and trees spanning tree, weighted spanning tree, Shortest path, Fundamental circuits. Rank and nullity, cut sets and cut vertices, Fundamental cut sets.

Unit- III

Connectivity and separability in graphs, Abstract graphs, geometric graphs, planar graphs, Kurtowski two graphs, Embedding and regions of a planar graphs, Detection of Planarity, Geometric dual and combinational dual.

Unit- IV

Coloring and covering of graphs, Chromatic Polynomial, chromatic partitioning, Dimmer problem, Domminating sets, Independent sets, Four colour conjecture.

Unit- V

Digraph and types of digraphs, Digraph and binary relation, Equivalence relation in a graph, Directed path, walk, circuit, and connectedness. Eulerian digraph, arborescence matrices A, B and C of digraph, Adjacency metric of a digraph, Algorithms, Kruskal algorithm, Prism algorithm, Dihkastra algorithm.

Text Book:

1. Graph Theory with Applications to Engineering and Computer Science by Narsingh. Deo.

Reference Book:

1. Graph Theory by Harary.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

April- May 2018

~~Nov-Dec 2015~~ 2019

M. Sc. IV Semester

Subject Mathematics

Paper III

Marks- (85, 15)

DISCRETE MATHEMATICAL STRUCTURES

Unit- I

Relation, Equivalence relation, Partitioning, Fundamental theorem on equivalence relation, ordered sets, First and last elements, maximal and minimal elements, upper and lower bounds, similar sets, Totally ordered sets, well ordered sets, Axioms of choice, Zorn's lemma, Well ordering theorem (statements only), Inclusion exclusion principle & Pigeon Hole principle.

Unit- II

Mathematical logic: Propositions and logical operators, Contradictions and Tautogies, Equivalence & Implication, Duality NAND and NOR connections, Functionally complete sets, Two-state devices and statements logic, Normal forms, Predicate calculus, Free and bound variables.

Unit- III

Lattice-Definition & examples, Distributive lattice, modular lattice, Bounded lattice, complemented lattice, Boolean lattice, Sublattice.

Unit- IV

Boolean algebra-Definition & examples, Basic Boolean algebra laws Principle of duality, Applications of Boolean algebra, Boolean functions, Disjunctive & Conjunctive normal forms, Switching circuits, Minimization of switches.

Unit- V

Mathematical Induction, Recursion, Recursion and iteration, closed form expression, sequence of integers, Recurrence relation, linear recurrence relation, and Homogeneous recurrence, Recurrence relations obtained from solutions, Solving linear homogenous recurrence relation, solving linear non-homogeneous recurrence relations, Generating functions, solution of recurrence relation using generating functions.

Text Books:

1. Discrete Mathematics by N.Ch. S.N. Iyengar, V.M. Chandra Sekharan, K.A. Venkatesh, P.S. Arunachalam- Vikas Publishing House Pvt. Ltd.
2. Set Theory-Schaum outline series.

Reference Books:

1. Discrete Mathematics and its applications by Keneth H. Rosen Tata Mc Graw Hill Pub, Ltd.
2. Discrete Mathematics for Computer Scientists by J.K. Truss, Pearson Education Asia Ltd.
3. Discrete Mathematical Structures with Applications by J.P. Tremblay, R. Manohar DataMc Graw Hill Pub. Company Ltd.

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Govt. K.R.G. P.G. (Auto) College, Gwalior

M. Sc. IV Semester

Subject Mathematics

April-May : ~~2018~~ 2019

~~Nov-Dec 2015~~

Paper IV

Math412 **Special Functions** Marks- (85, 15)

Unit- I

Gamma and Beta Functions

Gamma Functions, A series for $F'(z)/F'(z)$, Difference equation $F(z+1) = zF(z)$, Euler's integral for $F(z)$, Beta function, value of $F(z)\,F(4-z)$, Factorial Function, Legendre's duplication formula, Gauss multiplication theorem, The behavior of log $F(z)$ for large $|z|$.

Unit- II

Hypergeometric and Generalized Hypergeometric functions:

Gauss Hypergeometric Function ${}_2F_1$ and its convergence a simple integral form evaluation of ${}_2f_1(a, b; c; 1)$ Contiguous function relations, Hyper geometric differential evaluation Elementary series manipulations, simple transformation, generalized equation elementary series manipulations, simple transformation, Generalized hypergeometric function ${}_pF_q$ and its convergence, Whipple's theorem, Dixon's theorem.

Unit- III

Bessel function and Legendre polynomials

Definition of $J_n(z)$, Bessel's differential equation, Generating function, Recurrence relations, Generating function for Legendre polynomials, Rodrigues formula, Bateman's relations. Generating function, Additional functions, Hyper geometric forms of $P_n(x)$, special properties of P_n Some more functions, Laplace's first integral form, orthogonality.

Unit- IV

Hermite and Laguerre polynomials

Definition of Hermite and Laguerre polynomials, Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, Other generating functions, Orthogonality for Laguerre and Hermite polynomials.

Unit- V

Mascrobert's E-function and Meijer's G- Function

Definition of Mascrobert's E-function and its expansion in series of ${}_pf_q$ simple integrals involving E-function Meijer's G-function, Definition and Simple Properties, Simple multiplications theorems Differential equation for G-function

Books Recommended:

1. Rainville, E.D; Special Functions, The Macmillan co. New York 1971.
2. Mathai and Saxena: Generalized Hypergeometric function with Application in statistics and physical sciences, springer verlag, Heidelberg and New York,Lecture Notes no 348, 1973
3. Saran, N, Sharma S.D. and Trivedi,- Special Functions with application, Pragati prakashan, 1986.

Reference Books:

1. Lebdev, N.N. Special Functions and their Applictions, Prentice Hall, Englewood Chiffs, New jersey, USA 1995.
2. Whittaker, E.T. and Watson, G.N. course of Mc Graw Hill.

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