Estd. 2003

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA.

Syllabus for B.Sc. Optional Mathematics

V and VI Semesters

(Semester Scheme) with effect from

2020-21and onwards

V and VI semester syllabus Approved in BoS (UG) Mathematics dated 30-01-2020

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

1. The syllabus in Mathematics for V & VI Semesters of B.A/B.Sc. Degree Course.
2. Following table shows the number of teaching hours, examination pattern and marks.

		Semesters V&VI
Number of papers in each Semester		3
Teaching Hours per paper per Week	Teaching Problem Solving **Total**	4 Hours 1 Hour **5 Hours**
Examination pattern in each paper in each semester	Duration of Examination	3 Hours
i) Examination marks	a. Maximum b. Minimum for pass	80 32
ii) Internal Assessment marks	a. Maximum b. Minimum for pass	20 08
iii) Total Marks	a. Maximum b. Minimum for pass	100 40

3. Internal assessment marks in each paper shall be awarded by the concerned course teacher based on the two class tests each of one-hour duration conducted during the semester.
4. The internal assessment marks awarded shall be carried forward for the repeated examination.
5. The maximum strength of each section for teaching hours is restricted to sixty students only.
6. Problem solving classes be conducted in batches of not more than **15** students in each batch.
7. If student fails in any one paper of any semester, they should write that paper only.

B.A/B.Sc. DEGREE COURSE STRUCTURE FOR MATHEMATICS SUBJECT

SEMESTER-V

Paper No	Paper Title	Content of Topics
5.1	Paper-5.1	Fourier Series, Laplace Transforms & Linear Transformation
5.2	Paper-5.2	Differential Equations
5.3	Paper-5.3	Series Solutions, Improper Integrals and Vector Analysis

SEMESTER-VI

Paper No	Paper Title	Content of Topics
6.1	Paper-6.1	Numerical Analysis
6.2	Paper-6.2	Trigonometry and Complex Analysis
6.3	Paper-6.3	Topology

Paper 5.1

Fourier series, Laplace Transforms & Linear Transformation

Fourier series

Basic definition, Fourier series of functions with period 2π and period 2L, Half – Range cosine and sine expansion. **16hrs.**

Laplace Transforms

Definition and basic properties, Laplace transforms of coskt, sinkt, t^n, coshkt, sinhkt-L.T of $e^{at}F(t), t^nF(t), \frac{F(t)}{t}-$ problems thereon. Laplace Transforms of derivatives of function, Laplace Transforms of integrals of functions, Laplace transforms of periodic function, Inverse Laplace transform Problems and Convolution theorem. **20hrs.**

Linear Transformation

Linear Transformations: Definition, Properties and Examples, Matrix of a linear transformation-Definition, properties and examples. Change of basis- Range space, Null Space (Kernel), rank and Nullity of a linear transformation, Rank-Nullity theorem, Verification of Rank-Nullity theorem, examples and properties. **20hrs.**

References:

1. Murray R. Spiegel L : Laplace transforms (schaum series)
2. Churchill R.V. and Brown J.W: Fourier series and Boundary value problems (Mcgrow Hill)
3. Murray R. Spiegel : Advanced Calculus (Schaum Series)
4. G.K. Ranganath : A text book of Mathematics for 5th Semester.
5. I.N. Herstein – Topics in Algebra.
6. Stewart- Introductions to Linear Algebra.
7. S. Kumaresan-Linear Algebra.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA
DEPARTMENT OF MATHEMATICS
B.Sc.-V Semester.
Model Question Paper 5.1:Fourier series, Laplace Transforms & Linear Transformation.

Total Marks: 80 **Time: 3 Hrs**

Instructions:
1. **Part-A : All questions are compulsory**
2. **Part-B: Solve any Five questions from Seven questions**

Part-A

I. Answer the following questions

2x10=20

1-2 Fourier Series

3-6 Laplace Transform

7-10 Linear Transformation

Part-B

Answer any Five of the following questions (Each question carries equal marks)

12x5=60

II.

11-12 Fourier Series

III

13-14Laplace Transform/Fourier Series

IV

15-16 Laplace Transform

V

17-18Laplace Transform

VI

19-20 Linear Transformation

VII

21-22 Linear Transformation

VIII

23-24 Linear Transformation.

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Paper 5.2

Differential Equations

Linear Differential equations

Linear Differential equation of second order with variable co-efficient and solutions by following methods:

1. Complete solution in terms of known integral belonging to complementary function.
2. Method of changing the independent variable
3. Method of changing the dependent variable (Reduction to normal form).
4. Method of variation of parameters.
5. Method of finding the first integral. **20hrs.**

Total Differential Equations

Integrability, Necessary condition for integrability of the equation Pdx+Qdy+Rdz = 0 and condition for exactness, Solutions by inspection method-problems. Simultaneous differential equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. **16hrs.**

Partial Differential Equations

Formation of partial differential equations. Lagrange's Linear equations Pp+Qq = R. Standard types of first order linear partial differential equations and finding their complete integral. Equations reducible to standard form. Non-Linear equations of first order , Standard types of the following forms.

a) f(p,q) = 0 b) f(p,q,z) = 0 c) f(x,p) = g(y,q) d) Clairaut's form

e) Charpit'smethod(without proof) – problems thereon. **20hrs.**

References:

1. Boyce and Diprima Elementary Differential Equations and BVP (John Wiley &Sons).
2. Simmons G.F.: Differential Equations (TMH).
3. Cholton F.: Ordinary Differential Equations (Von-Norstand).
4. Ayres F.: Differential Equations (Schaum Series)
5. Ian N.Sneddan: Elements of Partial Differential Equations, McGraw Hill.
6. Stephenson G: An introduction to Partial Differential Equations (ELBS).
7. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA
Department of Mathematics
B.Sc.-V Semester.
Model Question Paper 5.2:Differential Equations.

Time: 3 HrsTotal Marks: 80

Instructions:

1. Part-A:All questions are compulsory

2. Part-B: Solve any Five questions from Seven questions (Each question carries equal marks)

Part-A
I. Answer the following questions **2x10=20**

1- 2 Linear Differential equations

3-6 Total Differential Equations

7-10 Partial Differential Equations

Part-B
Answer any Five of the following questions **12x5 = 60**

II.

11-12 Linear Differential equations

III

13-14 Linear Differential equations

IV

15-16 Total Differential Equations

V

17-18 Total Differential Equations

VI

19-20 Partial Differential Equations

VII

21- Partial Differential Equations

VIII

23-24 Partial Differential Equations

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Paper 5.3
Series Solutions, Improper Integrals and Vector Analysis

Series Solution:

Legendre differential equation. Legendre polynomailsP_n (x) as a solution, Rodrigue's formula, generating polynomials theorem, orthogonal property and basic recurrence relations. Bessel differential equation. Bessel function $J_n(x)$ as a solution – generation formula – integral formula for J_n (x): orthogonal property. Basic recurrence relations – problems there on.

25 hrs.

Improper Integrals

Improper integrals (definition only) Gamma and Beta Functions and results following the definition, relation between Beta and Gamma functions – applications of evaluation of integrals and Duplication formula (Statement). **16hrs.**

Vector Analysis

Scalar field, gradient of a scalar field, geometrical meaning, directional derivatives. Vector field, divergence and curl of a vector field. Solenoidal and irrotational fields. Laplacian of a scalar field. Vector identities. Greens, Gauss and Stokes theorems (Statements only) simple examples.

15 hrs.

1. Simmons G.F.: Differential Equations (TMH).
2. Cholton F.: Ordinary Differential Equations (Von-Norstand).
3. Ayres F.: Differential Equations (Schaum Series)
4. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.
5. Murray R, Spiegel L: Vector Analysis (Schaum Series).
6. Spain B: Vector Analysis (ELBS)
7. Murray R. Spiegel : Advanced Calculus (Schaum Series)
8. G.K. Ranganath : A text book of Mathematics for 5th Semester.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA
Department of Mathematics
B.Sc.-V Semester
Model Question Paper 5.3:Series Solutions, Improper Integrals and Vector Analysis

Time: 3 HrsTotal Marks: 80

Instructions:

1. Part-A:All questions are compulsory

2. Part-B:

Solve any Five questions from Seven questions (Each question carries equal marks)

Part-A
I. Answer the following questions **2x10=20**

1- 2 Series Solution

3-6 Improper Integrals

7-10 Vector Analysis

Part-B
Answer any Five of the following questions **12x5 = 60**

II.

11-12 Series Solution

III

13-14 Series Solution

IV

15-16 Series Solution andImproper Integrals

V

17-18 Improper Integrals

VI

19-20 Improper Integrals

VII

21-22 Vector Analysis

VIII

23-24 Vector Analysis

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PAPER 6.1

Numerical Analysis

Solution of Algebraic Equations

Solution of non-linear algebraic equations by the following methods.

1. Method of successive bisection (Interval bisection method).
2. Method of false position (Regula-Falsiethod).
3. Newton-Raphson's iterative method .

Solution of system of algebraic equations by the following methods

1. Gauss elimination method.
2. Jacobi iteration method.
3. Gauss-Seidel method. **16hrs.**

Finite Differences:

Definition and properties of Δ , ∇ and E. Relations between them. The nth differences of a polynomial.

Interpolation: Newton-Gregory forward and backward interpolation formulae, Lagrange's and Newton's interpolation formula for unequal intervals, inverse interpolation.

Numerical differentiation using forward and backward difference formulae. Computation of first and second derivatives.

Numerical integration: General Quadrature formula. Trapezoidal rule, Simpsons 1/3rd and 3/8th rules, Weddles rule, Problems thereon. Solution of initial value problem of ordinary linear first order differential equations by the following methods.

1. Picard's method
2. Euler's and Euler's modified method
3. Fourth order Runge- Kutta Methods. **30hrs.**

Difference Equations

Finite difference equations, homogeneous and non-homogenous difference equations of first order with constant coefficients. Solution of

1. Homogenous first order(linear) difference equations with constant coefficients and
2. Second order difference equations with constant coefficients. **10hrs.**

References:

1. Scheild P: Numerical Analysis (Schaum Series).
2. Sastry S.S.: Numerical Analysis (Prentice Hall of India).
3. Rajaram V.: Computer Oriented Numerical Method (Prentice Hall of India).
4. Balaguruswamy E.: Numerical Methods (Tata McGraw Hill).
5. M.K.Jain, S.R.K. Iyangar and R.K. Jain: Numerical Methods (New Age Int.).
6. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

Department of Mathematics

BSc – VI semester

Model Question Paper 6.1: Numerical Analysis

Total Marks 80 Time 3 Hrs

Instructions

1. Part A: All questions are compulsory

2. Part B : Solve any FIVE questions out of SEVEN questions

Part - A

I Answerthe following questions **10x2=20**

1-3 Solution of Algebraic Equations

4-7 Finite Differences

8-10 Difference Equations

Part -B

Answer any Five of the following questions **12x5=60**

II

11-12 Solution of Non-linear Algebraic Equations,

III

13-14 System of algebraic Equations

IV

15-16 n th differences of a polynomial & Interpolation

V

17-18 Interpolation

VI

19-20 Numerical Differentiation

VII

21-22 Numerical Integration & Initial Value Problems

VIII

23-24 Difference Equations

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Paper 6.2

Trigonometry and Complex Analysis

Trigonometry:

Expansion of $sinn\theta$ and $cosn\theta$ in terms of powers of $sin\theta$ or $cos\theta$ and expansion of $sin^n\theta$&$cos^n\theta$ in terms of sines and cosines of multiples of θusing De-Moiver's theorem. Relation between Hyperbolic and circular functions, derivation of standard formulae of hyperbolic functions. Logarithm of a complex number, finding real and imaginary parts and simple examples.

20 hrs.

Analytic Functions and Complex Integration

Functions of complex variables: Limit, continuity and differentiability. Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms. Sufficient conditions for analyticity (in Cartesian form). Real and imaginary parts of analytic function which are harmonic. Construction of analytic function, given real and imaginary parts.

The complex line integral: Examples and properties (definitions of the concepts like neighbourhood of a point, closed contour, etc. at appropriate places should be mentioned).

Cauchy integral theorem (statement) and its consequences. The Cauchy's integral formulae for the function and derivatives. Applications to the evaluation of simple line integrals. Cauchy's inequality theorem. **30 hrs.**

Residue Theorem

Residues and Residue theorem, valuation of real definite integrals around the unit circleand evaluation of $\int_{-\infty}^{\infty} f(x)dx$.

06hrs.

References:

1. Churchill R.V.: Introduction to Complex Variables and Applications (McGraw Hill).
2. Murray R. Spiegel: Complex Variables (Schaum Series).
3. Choudhary B.: The Elements of Complex Analysis (Wiley Eastern).
4. Murray R. Spiegel: Advanced Calculus (Schaum Series).
5. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

Department of Mathematics

B.Sc.-VI semester

Model Question Paper 6.2 :Trigonometry and Complex Analysis

Total Marks: 80 **Time: 3 Hrs**

Instructions:

1. **Part-A : All questions are compulsory**
2. **Part-B: Solve any Five questions from Seven questions**

Part-A

I. Answer the following questions

1-2 Trigonometry

3-8 Complex Analysis

9-10 Residue Theorem

Part-B

Answer any Five of the following questions (Each question carries equal marks) 12x5=60

II.

11-12 Trigonometry

III

13-14Trigonometry

IV

15-16 Complex Analysis

V

17-18Complex Analysis

VI

19-20 Complex Analysis

VII

21-22 Complex Analysis

VIII

23-24Residue Theorem

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Paper 6.3
Topology, Bases and Sub-bases

Topology

Definition of topology, topological spaces and examples there on. Discrete and indiscrete topological spaces, types of topologies- cofinite topology, countable topology, weaker and stronger topologies, comparable and non-comparable topologies and examples. Intersection and union of topologies. Closed, open sets and neighbourhoods.

Characterisation of open sets. Definition of Limit points, derived sets and closure of sets. Results on derived sets and properties of closure of sets. Definition of Interior, exterior and boundary of sets and results on interior of a set. **30hrs**.

Bases and Sub-bases

Base for the neighbourhood system of a point or local base, first countable space, properties of a topological space in terms of a local base.

Base for a topology: Second countable space, theorems on basefor a topology, properties of base for a topology, characterization of a topological space in terms of base.

Sub-base: Adherent points, limit points and derived sets in a topological space and theorem on derived sets. **26 hrs.**

References:

1. E. Sampath Kumar and K.S. Amur: Introduction to Modern Algebra and Topology.
2. General Topology by Seymour Lipschutz (Schum's Outline series).
3. Introduction to General Topology by K D Joshi(New Age International Publishers).
4. Topology by J.N.Sharma.Krshna Prakashaan Media(P) Ltd.

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

Department of Mathematics

B.Sc.-VI semester

Model Question Paper 6.3:Topology, Bases and Sub-bases

Total Marks: 80 **Time: 3 Hrs**

Instructions:

1. **Part-A : All questions are compulsory**
2. **Part-B: Solve any Five questions from Seven questions**

Part-A

I. Answer the following questions

1-5 Topology
6-10 Bases and Sub-bases

Part-B

Answer any Five of the following questions (Each question carries equal marks) 12x5=60

II.

11-12 Topology

III

13-14Topology

IV

15-16 Topology

V

17-18Topology

VI

19-20 Bases and Sub-bases

VII

21-22 Bases and Sub-bases

VIII

23-24Bases and Sub-bases

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