DAVANGERE UNIVERSITY

DEPARTMENT OF MATHEMATICS

Proposed Syllabus for B.Sc. Mathematics Paper for 6 Semesters under Choice Based Credit Scheme (CBCS)

Aims and objectives of introducing new syllabus

- To set up a mathematical laboratory in every college in order to help students in the exploration of mathematical concepts through activities and experimentation.
- To enable the teacher to demonstrate, explain and reinforce abstract mathematical ideas by using concrete objects, models charts, graphs pictures, posters with the help of FOSS Tools on a computer.
- To develop a spirit of enquiry and mathematical skills in the students.
- To prepare students to face new challenges in mathematics as per modern requirement.
- To make the learning process student – friendly.
- To provide greater scope for individual participation in the process of learning and becoming autonomous learners.
- To foster experimental, problem-oriented and discovery learning of mathematics.
- To help the student to build interest and confidence in learning the subject.
- To remove maths phobia through various illustrative examples and experiments.

SUPPORT FROM THE GOVT FOR STUDENTS AND TEACHERS IN UNDERSTANDING AND LEARNING FOSS TOOLS:

As a national level initiative towards learning FOSS tools, IIT Bombay for MHRD, government of India is giving free training to teachers interested in learning open

source software's like scilab, maxima, octave, geogebra and others.

Website : http://spoken-tutorial.org

Email : info@spokentutorial.org & contact@spoken-tutorial.org

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B.Sc MATHEMATICS SUBJECT SYLLABUS STRUCTURE

SEM	TITLE OF THE PAPER		TEACHING Hrs/WEEK	DURATION OF EXAM	I.A. MARKS	EXAM MARKS	TOTAL MARKS	SEM TOTAL MARKS	CREDITS
I	Paper I	BSM 1.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 1.1P	3 Hrs	3 Hrs	10	40	50		3
II	Paper II	BSM 2.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 2.1P	3 Hrs	3 Hrs	10	40	50		3
III	Paper III	BSM 3.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 3.1P	3 Hrs	3 Hrs	10	40	50		3
IV	Paper IV	BSM 4.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 4.1P	3 Hrs	3 Hrs	10	40	50		3
V	Paper V	BSM 5.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 5.1P	3 Hrs	3 Hrs	10	40	50		3
	Paper VI (OR) PaperVII	BSM 5.2T (OR) 5.3T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 5.2P (OR) 5.3P	3 Hrs	3 Hrs	10	40	50		3
VI	Paper VIII	BSM 6.1T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 6.1P	3 Hrs	3 Hrs	10	40	50		3
	Paper IX (OR) Paper X	BSM 6.2T (OR) 6.3T	4 Hrs	3 Hrs	20	80	100	150	4
		BSM 6.2P (OR) 6.3P	3 Hrs	3 Hrs	10	40	50		3
Total Marks								1200	

Theory Credits : 32
Practical Credits : 24
Total : 56

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Shivagangotri, Davangere – 577002

GRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

NEW SYLLABUS - 2016-17

Subject: MATHEMATICS

V Semester

Paper V - BSM 5.1T (DIFFERENTIAL EQUATIONS -III, ALGEBRA- III)

4 Lecture Hours/ Week + 3 Hrs Practical's/Week,

One batch cannot exceed 25 Students **Total: 56 Hrs**

DIFFERENTIAL EQUATIONS - III

Unit 1 : ORDINARY LINEAR DIFFERENTIAL EQUATIONS:

Solution of ordinary second order linear differential equation with variable coefficients by the methods: (1) When a part of complementary function is given (2) changing the independent variable (3) changing the dependent variable (4) when a first integral is given (exact equation) (5) variation of parameters.

Unit 2 : TOTAL AND SIMULTANEOUS DIFFERENTIAL EQUATIONS:

Necessary condition for the equation $P.dx+Q.dy+R.dz=0$ to be integrable - problems there on. Solutions of equation of the type $dx/P=dy/Q=dz/R$.

Unit 3 : PARTIAL DIFFERENTIAL EQUATIONS:

Formation of partial differential equation – Lagarange's linear equation: $Pp+Qq=R$, Four standard types of first order partial differential equations. **(42 hours)**

ALGEBRA-III

Unit 4 : RINGS, INTEGRAL DOMAINS AND FIELDS:

Rings- Types of rings- Properties of rings- Rings of integer modulo 'n'- Integral domains- Fields-Examples and properties following the definition- Subrings- Ideals- Principal, prime and maximal ideals in a commutative ring- Examples and standard properties following the definition. **(14 Hours)**

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PRACTICALS-V BSM 5.1P (DIFFERENTIAL EQUATIONS-III AND ALGEBRA - III)

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hours/ week per batch of not more than 15 students)

LIST OF PROBLEMS **Total: 30 Hrs**

1. Solving second order ordinary differential equation with variable coefficients
   a). When apart of the complementary function is given.
   b). By changing the independent variable.
2. Solving second order ordinary differential equation with variable coefficients.
   a). Method of variation of parameters.
   b). When the equation is exact.
3. Solutions to the problems on total differential equations.
4. Solutions to the problems on different types of partial differential equations (Type-I and Type-II)
5. Solutions to the problems on different types of partial differential equations (Type-III and Type-IV)
6. Illustration to show that given algebraic structure is a Ring.
7. Examples on different types of Rings (commutative Ring, Ring with unity and Ring with zero divisors)
8. Examples on Integral domains.
9. Examples on Fields.
10. Examples on subrings, ideals and subrings which are not ideals.

Books for References:

1. G. Stephonson – An introduction to Partial Differential Equations.
2. B. S. Grewal – Higher Engineering Mathematics
3. E. Kreyszig – Advanced Engineering Mathematics
4. E. D. Rainville and P E Bedient – A Short Course in Differential Equations
5. D. A Murray – Introductory Course in Differential Equations.
6. G. P. Simmons – Differential Equations
7. F. Ayres – Differential Equations (Schaum Series)
8. Martin Brown – Application of Differential Equations.
9. I. N. Herstien – Topics in Algebra.
10. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra.
11. T. K. Manicavasagam Pillai and K S Narayanan – Modern Algebra Volume 2
12. J B Fraleigh – A first course in Abstract Algebra.

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Paper VI - (ELECTIVE) BSM 5.2T (NUMERICAL METHODS-I, CALCULUS-IV)

4 Lecture Hrs/ Week + 3 Hrs Practical's/Week,

One batch cannot exceed 25 Students **Total: 56 Hrs**

NUMERICAL ANALYSIS

NUMERICAL METHODS - I

Unit 1 : FINITE DIFFERENCES

Definition and properties of Δ, ∇, D and E, the relation between them – The nth differences of a polynomial - Newton–Gregory forward and backward interpolation formulae – Lagrange's interpolation formula for unequal intervals - Inverse interpolation.

Unit 2 : NUMERICAL INTEGRATION:

General Quadrature formula – Trapezoidal rule -Simpson's 1/3rd rule and Simpson's 3/8th rule (without proofs) and problems.

Numerical solutions of algebraic equations – By method of successive bisection – Newton-Raphson iterative method.

Unit 3 : SOLUTION OF INITIAL VALUE PROBLEMS :

Solution of initial value problems for ordinary linear first order differential equations by Taylor's series, Euler's and Euler's modified method and Runge-Kutta 4th ordered method. **(42 Hours)**

CALCULUS-IV:

Unit 4 : LINE AND MULTIPLE INTEGRALS:

Definition of line integral and basic properties, examples evaluation of line integrals. Definition of double integral – its conversion to iterated integrals .Evaluation of double integrals by change of order of integration and by change of variables -Definition of triple integral and evaluation – change of variables .**(14 Hours)**

PRACTICALS – VI BSM 5.2P (NUMERICAL METHODS-I, CALCULUS-IV)

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hours/ week per batch of not more than 15 students)

LIST OF PROBLEMS **Total: 30 hours**

1. Solution of algebraic equation by bisection method.
2. Solution of algebraic equation by Newton-Raphson method.
3. Newton's forward and backward interpolation.
4. Lagrange's interpolation formula for unequal intervals.
5. Numerical integration by Trapezoidal rule.
6. Numerical integration by Simpson's 1/3rd and 3/8th rules.
7. Solving ordinary differential equation by Modified Euler's method .
8. Solving ordinary differential equation by Runge-kutta fourth order method.
9. Evaluation of line,double and triple integrals with constant limits.
10. Evaluation of line, double and triple integrals with variable limits.

Books for References:

1. B. D Gupta – Numerical Analysis
2. H. C Saxena – Finite Difference and Numerical Ana;ysis
3. S. S. Shastry- Introductory Methods of Numerical Analysis
4. B. S. Grewal – Numerical Methods for Scientists and Engineers
5. E. Ksreyszig – Advanced Engineering Mathematics.
6. S.S.Shastry-Introductory methods of Numerical Analysis.
7. F.Scheild- Numericl Analysis

Paper VII - (ELECTIVE): BSM 5.3T

4 Lecture Hrs/ Week + 3 Hrs Practical's/Week,

One batch cannot exceed 25 Students **Total: 56 Hrs**

Unit-1: LINEAR PROGRAMMING:

Linear inequalities and their graphs, Statement of the Linear Programming Problem in standard form-Classification of solutions-Solution of Linear Programming Problems by Graphical method. Illustrative examples on the solution of Linear Programming Problems in two and three variables by the Simplex method. **(14 hours)**

Unit-2 : FOURIER TRANSFORMS:

The Fourier integral, complex Fourier Transform, Inverse Transforms-Basic properties, Transforms of the derivate and Derivative of the Transform-Convolution theorem - Parseval's identity - problems there on. Fourier sine and cosine transforms and inverses - Transforms for first and second order derivatives - problems there on. **(14 hours)**

Unit-4: Z-TRANSFORMS:

Definition and basic properties-Some standard Z-Transforms - Linearity property-Damping rule- Some standard results- Shifting Un to the right to the left, Multiplication by n- Two basic theorems(Initial value and Final Value Theorems). Some useful Z-Transforms and Inverse Z-Transforms- Evaluation of inverse Z-Transforms (Power series method)-Application to Differential Equations. **(8 hours)**

SUMMATION OF SERIES:

Summation of Binomial , Exponential and Logarithmic series. **(6 hours)**

Unit-4: SPECIAL FUNCTIONS:

Legendre's differential equation-Legendre polynomials - Rodrigue's formula - General form of Pn(x)- Generating function for Pn(x) - Recurrence relations for Pn(x) - Orthogonality of Legendre polynomials - Bessel's Differenential Equation - Bessel's functions - Properties of Bessel's function and examples - Recurrence relations for Jn(x) - Generating Function for Jn(x) and examples - Orthogonality of Bessel's Functions . **(14 hours)**

PRACTICALS – VII: BSM 5.3P

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hours/ week per batch of not more than 15 students)

LIST OF PROBLEMS: **TOTAL :30 HOURS**

1. Fourier transform of some simple functions.
2. Inverse Fourier transform of some simple functions.
3. Examples to find the Fourier sine transforms of given functions.
4. Examples to find the Fourier cosine transforms of given functions.
5. Z-transform of some simple functions.
6. Inverse Z-transform of some simple functions.
7. Solution of linear inequalities.
8. Solving the LPP in two and three variables by simplex method.
9. Summation of binomial, exponential and logarithmic series.
10. Solution of Legendre and Bessel's differential equations

BOOKS FOR REFERENCE:

1. Raisinghania M.D.-Laplace and Fourier Transforms, S.Chand publication.
2. Ayres.F- Differential Equations.
3. S.C.Malik- Real Analysis.
4. Shantinarayan- Real Analysis.
5. Richard .R. Goldberg-Methods of Real Analysis.
6. Asha Rani Singhal and M.K.Singhal- A First course in Real Analysis.
7. S.C.Malik and Savitha Arora- Mathematical Analysis.
8. I.N.Sneddon- Fourier Transforms(McGraw Hill)
9. E. Kreyszig – Advanced Engineering Mathematics.
10. M.D.Raisinghania-Advanced differential equations.
11. P. Ramamurthy- Operations research

VI Semester

Paper VIII (COMPULSORY)- BSM 6.1T (ANALYSIS - II, ALGEBRA-IV)

4 Lecture Hours/ Week + 3 Hrs Practical's/Week,

One batch cannot exceed 25 Students **Total: 56Hrs**

ANALYSIS - II

COMPLEX ANALYSIS :

Unit 1 :

Complex numbers-Cartesian and polar form-geometrical representation-complex Plane-Euler's formula- $e^{i\theta} = \cos\theta + i\sin\theta$. Functions of a complex variable-limit, continuity and differentiability of a complex function. Analytic functions, Cauchy-Riemann equations in Cartesian and Polar forms-Sufficiency conditions for analyticity (Cartesian form only)

Harmonic functions-standard properties of analytic functions-construction of analytic function when real or imaginary part is given-Milne Thomson method.

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Unit 2 :

Complex integration : the complex integration –properties-problems. Cauchy's Integral theorem-(proof using Green's theorem)- direct consequences. Cauchy's Integral formula with proof-Cauchy's generalized formula for the derivatives with proof and applications for evaluation of simple line integrals - Cauchy's inequality with proof – Liouville's theorem with proof. Fundamental theorem of algebra with proof.

(28 Hours)

ALGEBRA-IV
LINEAR ALGEBRA
Unit-3 : VECTOR SPACES:

Vector Spaces- Definition and Examples - properties of vector spaces- Subspaces- Definition, Examples, properties and Theorems on subspaces- Criterion for a subset to be a subspace- Linear span- Linear combination of vectors- Linearly independent and linearly dependent subsets- Theorems there on- Basis and dimensions- Standard properties- Examples illustrating concepts and results.

Unit-4 : LINEAR TRANSFORMATIONS:

Linear Transformations-Definition, Properties and Examples- Matrix of a linear transformation- Definition, Properties and Examples- Change of basis- Range space, Nullspace(Kernel), rank and nullity of a linear transformation- Rank – nullity theorem - Verification of Rank - Nullity Theorem - Examples and Properties.

(28 Hours)

PRACTICALS – VIII BSM 6.1P (ANALYSIS - II, ALGEBRA-IV)

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hrs/ week per batch of not more than 15 students)

LIST OF PROBLEMS **Total: 30 Hours**

1. Some problems on Cauchy-Riemann equations (polar form).
2. Implementation of Milne-Thomson method of constructing analytic functions(simple examples).
3. Illustrating orthogonality of the surfaces obtained from the real and imaginary parts of an analytic function.
4. Verifying real and imaginary parts of an analytic function being harmonic (in polar coordinates).
5. Verifying Cauchy Integral formula
6. Examples connected with Cauchy's integral theorem.
7. a) vector space , subspace- illustrative examples.
   b) Expressing a vector as a linear combination of given set of vectors.
   c) Examples on linear dependence and independence of vectors.
8. a) Basis and Dimension-illustrative examples.
   b)Verifying whether a given Transformation is linear.
9. Finding matrix of a linear transformation.
10. Problems on rank and nullity.

Books for References:

1. L. V. Ahlfors – Complex Analysis
2. Bruce P. Palica – Introduction to the Theory of Function of a Complex Variable
3. Serge Lang – Complex Analysis
4. Shanthinarayan – Theory of Functions of a Complex Variable
5. S. Ponnuswamy – An introduction to Complex Analysis
6. R. P. Boas – Invitation to Complex Analysis.
7. R. V .Churchil & J. W. Brown- Complex Variables and Applications, 5th ed.:McGraw Hill Companies., 1989.
8. A. R. Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012.
9. I.N.Herstien-Topics in Algebra.
10. Stewart-Introduction to Linear Algebra.
11. S.Kumaresan-Linear Algebra.
12. G.D.Birkoff and S.Maclane-A brief surey of Modern Algebra.
13. Gopalakrishna- University Algebra.

Paper-IX (ELECTIVE)- BSM 6.2T (CALCULUS-V,MATHEMATICAL METHODS)

4 Lecture Hours/ Week + 3 Hrs Practical's/Week,

One batch cannot exceed 25 Students **Total: 56Hrs**

Unit 1 : INTEGRAL THEOREMS:

Green's theorem (with proof) - Direct consequences of the theorem. The Divergence theorem (with proof) - Direct consequences of the theorem. The Stokes' theorem (with proof) - Direct consequences of the theorem. **(14 Hours)**

Unit 2 : IMPROPER INTEGRALS:

Improper Integrals (definition only) – Gamma and Beta functions and results following the definitions – Connection between Beta and gamma functions – applications of evaluation of integrals – Duplication formula. **(14 Hours)**

Unit 3 : LAPLACE TRANSFORMS:

Definition and basic properties – Laplace transforms of cos kt, sin kt, , tn, cosh kt and sinh kt – Laplace transforms of eat F(t), tn F(t), F(t)/t – problems – Laplace transforms of derivatives of functions – Laplace transforms of integrals of functions – Laplace transforms of α- functions – Inverse Laplace transforms – problems- Convolution theorem. **(14 Hours)**

Unit 4 : FOURIER SERIES:

Introduction- Periodic functions- Fourier series and Euler formulae(statement only)-Even and Odd Functions-Trigonometric Fourier series of functions with period 2π and period 2L – Half range Cosine and sine series. Problems there on. **(14 Hours)**

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PRACTICALS–IX(ELECTIVE)- BSM 6.2P(CALCULUS-V,MATHEMATICAL METHODS)

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hours/ week per batch of not more than 15 students)

LIST OF PROBLEMS **Total: 30 Hours**

1. Verifying Green's theorem.
2. Verifying Gauss divergence theorem.
3. Verifying Stokes' theorem
4. To plot periodic functions with period 2π and 2L
5. To find full range trigonometric Fourier series of some simple functions with period 2π and 2L.
6. Plotting of functions in half-range and including their even and odd extensions.
7. To find the half-range sine and cosine series of simple functions.
8. To find the half-range sine and cosine series of simple functions.
9. Finding the Laplace transforms of some standard functions.
10. Finding the inverse Laplace transform of simple functions.

Books for References:

1. F B Hildebrand, *Methods in Applied Mathematics,*
2. B Spain,*Vector Analysis* , ELBS, 1994.
3. D E Bournesand, P C Kendall, *Vector Analysis,* ELBS, 1996.
4. B. S. Grewal – Higher Engineering Mathematics
5. S.C Malik –Real Analysis
6. Murray R Speigel – Laplace Transforms
7. S.C.Malik and Savita Arora, *Mathematical Analysis,* 2nd ed. New Delhi, India: New Age international (P) Ltd.,
8. Richard R Goldberg, Methods of Real Analysis, Indian ed.
9. Asha Rani Singhal and M .K Singhal, A first course in Real Analysis
10. E.Kreyszig- Advanced Engineering Mathematics, Wiely India Pvt. Ltd.
11. Leadership project – Bombay university- Text book of mathematical analysis.
12. S. S. Bali – Real analysis.

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Paper-X (ELECTIVE) - BSM 6.3T

4 Lecture Hours/ Week + 3 Hrs Practical's/Week,
One batch cannot exceed 25 Students **Total: 56Hrs**

Unit 1 : GEOMETRY OF SPACE CURVES:

Vector function of a single variable- Its interpretation as a space curve- derivative-tangent, normal and Binormal vectors to a space curve - Serret Frenet formulae - simple geometrical applications. Vector function of two scalar variables- Its interpretation as a surface- Tangent plane and normal to a surface- Parametric curves on a surface-Parametric curves on the surfaces of a right circular cylinder and sphere-Polar, Cylindrical and Spherical Co-ordinates. **(14 Hours)**

Unit-2: RIEMANN INTEGRATION:

The Riemann Integral, Upper and lower sums-Refinement of partitions-Upper and lower integrals-Integrability-Criterion for integrability-Integrability of Continuous functions and monotonic functions-Integral as the limit of a sum-Integrability of the sum and product of integrable functions-Integrability of the modulus of an integrable function-The fundamental theorem of calculus-Change of variables-Integration by parts-First and second mean value theorems of integral calculus. **(14 Hours)**

Unit-3: CALCULUS OF VARIATION :

Variation of a function f=f(x,y,y') - Variation of the corresponding functional - Extremal of a functional - Variational Problem - Euler's equation and its particular forms - Examples - Standard problems like Geodesics, minimal surface of revolution,hanging chain, Brachistochrone problem - Isoperimetric problems.

(14 Hours)

Unit-4: PARTIAL DIFFERENTIAL EQUATIONS :

Solution of second order linear partial differential equations in two variables with constant coefficients by finding Complementary Function and Particular Integral - Canonical forms for Parabolic, Elliptic and Hyperbolic Equations - Solution by Separation of Variables. Solutions of one-dimensional heat and wave equations and two Dimensional Laplace Equation by the method of Separation of variables. **(14 hours)**

PRACTICALS – X (ELECTIVE)- BSM 6.3P

Mathematics practical with Free and open Source Software (FOSS) tools for computer programs (3 hours/ week per batch of not more than 15 students)

LIST OF PROBLEMS **Total: 30 Hours**

1. Finding the tangent, normal and binomial vectors to a space curve.
2. Finding the curvature and torsion of a given space curve.
3. Finding the tangent plane and normal line to a surface.
4. Upper and lower sums of a Riemann integral.
5. Integral as the limit of a sum.
6. Fundamental theorem of integral calculus.

7. Example on Euler's equation in full form.
8. Examples on isoperimetric problems.
9. Solution of 2nd order linear partial differential equations with constant coefficients.
10. Solution of one dimensional heat and wave equation with Dirichlet's condition

Books for reference:

1. S.C.Malik- Mathematical Analysys.
2. Shantinarayan- Mathematical Analysis.
3. Leadership Project- Bombay University-Text book of Mathematical Analysis.
4. S.S.Bali -Real Analysis.
5. A. S. Gupta- Calculus of variations with applications
6. Charles B Morrey Jr.- Multiple integrals in calculus of variations
7. E.Kreyszig- Advanced Engineering Mathematics.
8. Barrett O'Neill- Elementary Differential geometry
9. K. Sankar Rao- Introduction to partial differential equations
10. M. D. Raisinghania- Ordinary and partial differential equations

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B.Sc FIFTH SEMESTER (Paper - V) MATHEMATICS QUESTION PAPER PATTERN. (COMPULSORY)

Time: 3Hrs Note: All parts are compulsory **Max Marks: 80**

PART-A

A. Answer any TEN of the following. **10 x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 3
8) Unit 3
9) Unit 3
10) Unit 3
11) Unit 4
12) Unit 4

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
    b) Unit 4
22) a) Unit 2
    b) Unit 4
23) a) Unit 3
    b) Unit 4
24) a) Unit 1
    b) Unit 3
25) a) Unit 2
    b) Unit 1

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B.Sc FIFTH SEMESTER (Paper - VI)(ELECTIVE) MATHEMATICS QUESTION PAPER PATTERN.

Time: 3Hrs Note: All parts are compulsory **Max Marks: 80**

PART-A

A. Answer any TEN of the following. **10 x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 3
8) Unit 3
9) Unit 3
10) Unit 3
11) Unit 4
12) Unit 4

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
    b) Unit 4
22) a) Unit 2
    b) Unit 4
23) a) Unit 3
    b) Unit 4
24) a) Unit 3
    b) Unit 1
25) a) Unit 2
    b)Unit 1

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B.Sc FIFTH SEMESTER (Paper - VII)(ELECTIVE) MATHEMATICS QUESTION PAPER PATTERN.

Time: 3Hrs Note: All parts are compulsory **Max Marks: 80**

PART-A

A. Answer any TEN of the following. **10 x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 3
8) Unit 3
9) Unit 3
10) Unit 3
11) Unit 4
12) Unit 4

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
    b) Unit 4
22) a) Unit 2
    b) Unit 4
23) a) Unit 3
    b) Unit 4
24) a) Unit 3
    b) Unit 1
25) a) Unit 2
    b)Unit 1

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B.Sc SIXTH SEMESTER (Paper-VIII) MATHEMATICS QUESTION PAPER PATTERN. (COMPULSORY)

Time: 3Hrs Note: All parts are compulsory **Max Marks : 80**

PART-A

A. Answer any TEN of the following. **10 x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 4
8) Unit 4
9) Unit 4
10) Unit 4
11) Unit 3
12) Unit 3

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
b) Unit 3
22) a) Unit 2
b) Unit 3
23) a) Unit 3
b) Unit 4
24) a) Unit 1
b) Unit 2
25) a) Unit 4
b) Unit 1

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B.Sc SIXTH SEMESTER (Paper-IX)(ELECTIVE) MATHEMATICS QUESTION PAPER PATTERN.

Time: 3Hrs Note: All parts are compulsory **Max Marks: 80**

PART-A

A. Answer any TEN of the following. **10x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 3
8) Unit 3
9) Unit 4
10) Unit 4
11) Unit 4
12) Unit 4

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
    b) Unit 3
22) a) Unit 2
    b) Unit 3
23) a) Unit 4
    b) Unit 3
24) a) Unit 1
    b) Unit 2
25) a) Unit 4
    b) Unit 1

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B.Sc SIXTH SEMESTER (Paper-X)(ELECTIVE) MATHEMATICS QUESTION PAPER PATTERN.

Time: 3Hrs Note: All parts are compulsory **Max Marks: 80**

PART-A

A. Answer any TEN of the following. **10x 2 = 20**

1) Unit 1
2) Unit 1
3) Unit 2
4) Unit 2
5) Unit 2
6) Unit 2
7) Unit 3
8) Unit 3
9) Unit 4
10) Unit 4
11) Unit 4
12) Unit 4

PART-B

B. Answer any SIX of the following. **6 x 5 =30**

13) Unit 1
14) Unit 1
15) Unit 2
16) Unit 2
17) Unit 3
18) Unit 3
19) Unit 4
20) Unit 4

PART - C

C. Answer any THREE of the following. **3 x 10 = 30**

21) a) Unit 1
    b) Unit 3
22) a) Unit 2
    b) Unit 3
23) a) Unit 4
    b) Unit 3
24) a) Unit 1
    b) Unit 2
25) a) Unit 4
    b) Unit 1

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