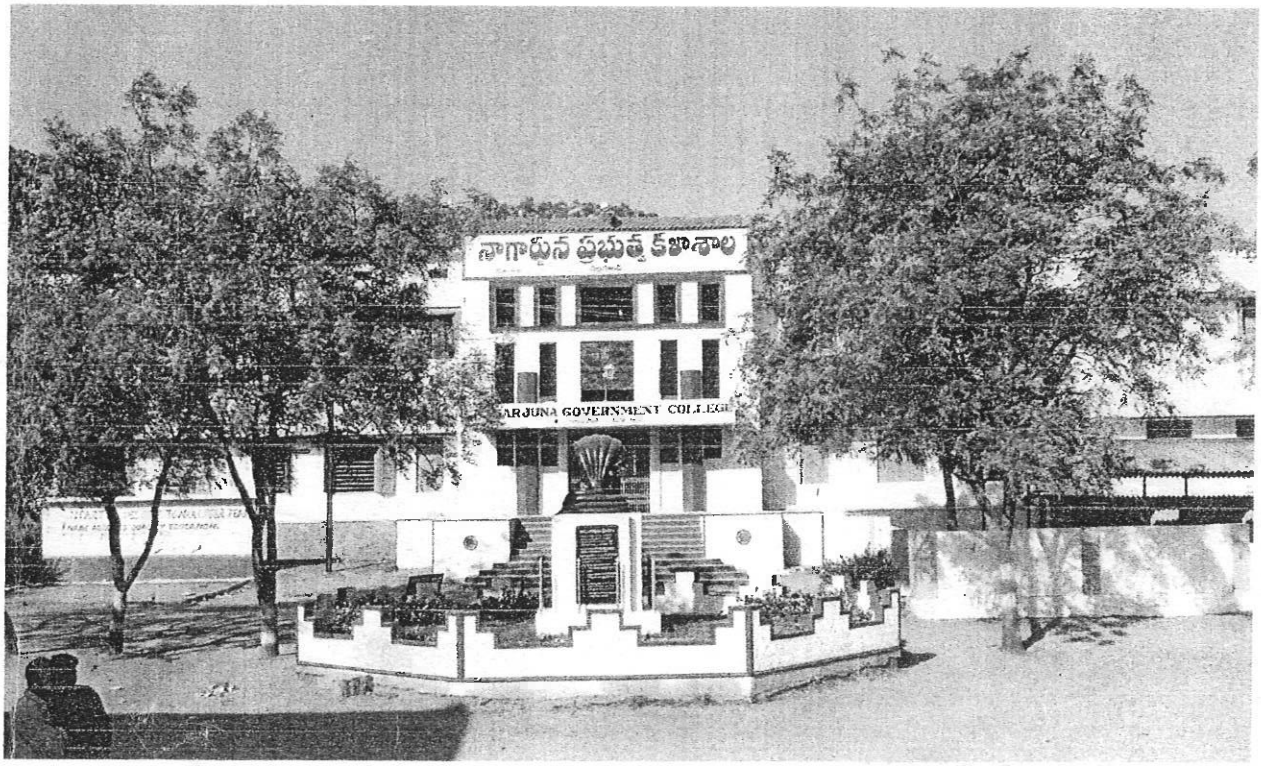
NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

(Autonomous) Reaccredited by NAAC with 'A' Grade

(Affiliated to Mahatma Gandhi University)

(www.ngcnalgonda.org)

BOARD OF STUDIES 2017-18



DEPARTMENT OF MATHEMATICS

NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

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DEPARTMENT OF MATHEMATICS

BOARD OF STUDIES MEETING

The members of Board of Studies in Mathematics department, N.G.College, Nalgonda met under the chairmanship of Sri.V.Srinivas Reddy on 13/10/2017 at Department of Mathematics, N.G.College, discussed the following agenda and passed the resolutions.

AGENDA

1. To consider and approve the Choice Based Credit System (Earlier CBCS) and Cumulative Grade Point Average (CGPA) system for B.Sc. III Year students (V & VI Semesters) for the academic year ~~2017-18~~ 2018-19. I, II, & III

2. To consider and approve the syllabus for B.Sc. I & II years (I, II, III, & IV, V & VI Semesters with New CBCS) for the academic year ~~2017-18~~ 2018-19.

3. To consider and approve the syllabus for B.Sc. I, II, III years (I,II,III,IV,V & VI Semesters) for the academic year 2017-18

4. To consider and approve the modules (Units) and setting of Question papers as 70:30 for Theory External and Internal assignments for B.Sc. I, II & III Year (I,II,III,IV,V&VI Semesters) for the academic year 2017-18.

5. To consider and approve the syllabus of practical examinations at the end of Vi semesters for B.Sc. III year students and syllabus of practical examinations at End of each Semester of for I year and II year students.

6. To consider and approve the model question papers for B.Sc.I, II & III year for the academic year 2017-18.

7. To consider approve the Syllabus SEC in IV Semester

8. To consider and approve the list examiners for paper setting and evaluation for the academic year 2017-18.

Any other related academic matters.

RESOLUTIONS

1. The Choice Based Credit System (~~Earlier~~ CBCS) and Cumulative Grade Point Average (CGPA) System can be implemented for the B.Sc. III Year (V & VI Semesters) students for the academic year 2017-18.

2. The Choice Based Credit System (NEW CBCS) and Cumulative Grade Point Average (CGPA) System can be implemented for the B.Sc. I Year and II Year (I,II,III & IV Semesters) students for the academic year 2017-18.

3. Unitization of syllabus into 4 units (module) for each paper and approved the syllabus for B.Sc.,(Maths) I, II & III year (I,II,III,IV,V&VI) semesters for the academic year 2017-18

4. The evaluation of the students for each semester of I, II, III, IV, V & VI Consists 100 marks in the ratio of 70:30 External End Theory exam – 70 marks and internal exam consist 30 marks (Internal Assessment 20 Marks, Assignment 5 Marks and Seminar 5 Marks). Two Internal Exams will be conducted for each semester and best of two will be considered.

5. Approved the syllabus for I, II, III, IV, V, VI, VII & VIII papers and approved the syllabus for Practical Examinations for each semesters for the I & II years and also approved the syllabus for Practical examinations B.Sc III year at the End of VI Semester the syllabus approved and followed the practical question bank (as for University question bank) .

6. Approved the syllabus and model question papers for each semester for the academic year 2017-18.

7. Approved the Syllabus SEC (Theory of equations) in IV Semester for Mathematics stream

8. Approval the panel of examiners for paper setting and evaluation for the academic year 2017-18.

① Sri V. Srinivas Reddy,

PANEL OF EXAMINERS (2017-18)

Sri G. Narender Reddy, Asst. Professor of

1. Sri B.Madan Mohan, Rtd. ~~Leeturer~~ in Mathematics, GDC, Hayathnagar, ~~Hyderabad.~~ R.R
2. Sri P.Ram Mohan Reddy, Associate Professor in Mathematics, Giriraj ~~GDC, Nizambad.~~ NZD (at)
3. Sri B.Rajender Kumar, Associate Professor in Mathematics, ~~Tara GDC~~, Sangareddy.
4. Sri V.Yadaiah, Asst. Professor in Mathematics, GDC, ~~Jogipet.~~ (w) Nalgonda.
5. Sri Dr.G.Upender Reddy, Asst.Professor, MGU, Nalgonda.
6. Sri G.Narender Reddy, Asst. Professor in Mathematics, GDC, ~~Ramannapet.~~ Hyathnagar
7. Sri B.Rajasekhar, Asst. Professor in Mathematics, GDC, ~~Ramannapet.~~ (w) Nalgonda.
8. Sri Janaiah, Asst. Professor in Mathematics, ~~MKRGDC~~, Devarakonda. GDC, Malkajgiri
9. Sri Venkatshwar ~~Rao~~, Asst. Professor in Mathematics, ~~MKRGDC~~, Devarakonda. GDC, Malkajgiri
10. Sri Saidi Reddy Asst. Professor in Mathematics, KRR GDC, Kodad.
11. Ch. Narsimha Raju Asst. Prof in Maths GDC Ramannapet

SIGNATURES OF THE MEMBERS.

1. V. Srinivas Reddy I/c Dept of Maths NAC Nalgonda — Chairman BOS in Maths — 13/10/17
2. Ch. Venkateswarulu Asst. Prof. of Maths MKR GDC DVK — University nominee
3. G. Narender Reddy Asst. Prof. of Maths GDC RMPT — Subject expert — 13/10/17
4. BSSP. Raja Shekar Asst. Prof. of Maths GDC RMPT — Subject expert — 13/10/17
5. Dr. S. Upender Asst. Prof. of Maths NAC Nalgonda — Member
6. D. Madhukar contract lecturer NAL — Member
7. Kamalkaiah Contract lecturer — Member

NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

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ALLOCATION OF CREDITS AT SUBJECT LEVEL

(Earlier CBCS)

Course: SCIENCE **Subject: Mathematics**

S. No	Semester	Module (Paper)	Hours Per Week	Max. Marks	Credits
1	I (Core)	Differential Equations	4	100	3
2	II (Core)	Solid Geometry	4	100	3
3	Practical	Differential Equation & Solid Geometry	3	50	2
4	III (Core)	Real Analysis	4	100	3
5	IV(Core)	Abstract Algebra	4	100	3
6	Practical	Real Analysis & Abstract Algebra	3	50	2
7	V (Advanced)	Linear Algebra	4	100	3
8	V (Elective)	i) Numerical Analysis – I ii) Laplace transformation	3	100	2
9	Practical	Linear Algebra, Vector Calculus & Multiple integrals	3	50	2
10	VI (Skill)	Vector calculus & Multiple integrals	4	100	3
11	VI(Elective)	i)Fourier transforms & Series ii) Numerical Analysis-II	3	100	2
12	Practical	Numerical Analysis	3	50	2
13	Project work				1
14	General Elective	Fundamentals of Mathematics	2		2

13/10/17

NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

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SYLLABUS FOR MATHEMATICS (NEW CBCS)

B.Sc. I Year - I Semester – MODULE – I (w.e.f. 2017-18)

DIFFERENTIAL CALCULUS

15 Hours

Objective: The course is aimed at explosing the students to some basic notions in differential calculus.

Outcome: By the time students completes the course they realize wide ranging applications of the subject.

UNIT – I

Successive differentiation – Expansions of Functions- Mean value theorems.

15 Hours

UNIT - II

Indeterminate forms – Curvature and Evolutes.

15 Hours

UNIT - III

Partial differentiation – Homogeneous functions – Total derivative

15 Hours

UNIT - IV

Maxima and Minima of functions of two variables – Lagrange's method of multipliers- Asymptotes – Envelopes.

Text: Shanti Narayan and Mittal, Differential Calculus

References: William Anthony Granville, Percey F Smith and William Raymond Longley; Elements of the differential and integral calculus

Joseph Edwards, Differential calculus for beginners
Smith and Minton, Calculus
Elis Pine, How to Enjoy Calculus
Hari Kishan, Differential Calculus

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NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

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SYLLABUS FOR MATHEMATICS (NEW CBCS)

B.Sc. I Year - II Semester –MODULE II (w.e.f. 2017-18)

DIFFERENTIAL EQUATIONS

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science

UNIT – I

Differential Equations of first order and first degree:
Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential Equations – Equations of the form $dx/P=dy/Q=dz/R$.
Differential equations first order but not of first degree: Equations Solvable for y- Equations Solvable for x – Equations that do not contain x (or y) – Clairaut's equation.

UNIT - II

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients-Solution of non- homogeneous differential equations $P(D)y=Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = bx^k$, be^{ax},$e^{ax}V$, b cos (ax),b sin(ax)

UNIT - III

Method of undetermined coefficients – Method of variation of parameters – Linear differential equations with non constant coefficients – The Cauchy – Euler Equation.

UNIT - IV

Partial Differential equations – Formation and solution – Equations easily integrable – Linear equations of first order – Non linear equations of first order Chairpit's method – Non homogeneous linear partial differential equations – Separation of variables.

Textg: Zafar Ahsan, Differential Equations and Their Applications
References: Frank Ayres Jr, Theory and Problems of Differential Equations
Ford, L.R, Differential Equations
Daniel Muray, Differential Equations
S.Balachandra Rao, Differential Equations with Applications and Programs
Stuart P Hastings, J Bryce McLead; Classical Methods in Ordinary Differential Equations.

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SYLLABUS FOR MATHEMATICS (NEW CBCS)

B.Sc. II Year - III Semester –MODULE III (w.e.f. 2017-18)

REAL ANALYSIS

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

UNIT – I

Sequences: Limits of Sequences – A Discussion about Proofs – Limit Theorems for Sequences – Monotone Sequences and Cauchy Sequences.

UNIT - II

Subsequences – Lim sup's and Lim inf's -Series- Alternating Series and Integral Tests

UNIT - III

Sequences and Series of Functions: Power Series – Uniform Convergence-More on Uniform Convergence – Differentiation and Integration of Power Series (Theorems in this section without Proofs)

UNIT - IV

Integration: The Riemann Integral – Properties of Riemann Integral – Fundamental Theorem of Calculus.

Text: Kenneth A Ross, *Elementary Analysis-The theory of Calculus*

References: William F. Trench, *Introduction to Real Analysis*
Lee Larson, Introduction to Real Analysis I.

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SYLLABUS FOR MATHEMATICS (NEW CBCS)

B.Sc. II Year - IV Semester –MODULE IV (w.e.f. 2017-18)

Algebra

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

UNIT – I

Groups: - Definition and Examples of Groups – Elementary Properties of Groups-Finite Groups Subgroups – Terminology and Notation – Subgroups Tests – Examples of Subgroups Cyclic Groups Properties of Cycli Groups – Classification of Subgroups Cyclic Groups – Permutation Groups: Definition and Notation – Cycle Notation – Properties of Permutations – A Cheek Digit Scheme Based on D_5.

UNIT - II

Isomorphisms: Motivation – Definition and Examples – Cayley's Theorem properties of Isomorphisms – Automorphisms – Cosets and Lagrange's Theorem Properties of Cosets 138 – Lagrange's Theorem and Consequences – An Application of Cosets to Permutation Groups – The Rotation Group of a Cube and a Soccer Ball – Normal Subgroups and Factor Groups ; Normal subgroups – factor groups applications of factor Groups – Groups Homeomorphisms-Definition and Examples – Properties of Homomorphism's – The First Isomorphism Theorem.

UNIT - III

Introduction to rings: motivation and Difinition – Examples of Rings – Properties of Rings – Subrings – Integral Domains; Definition and Examples – Characteristics of a Ring – Ideals and Factor Rings: ideals-Factor Rings – Prime Ideals and Maximal Ideals.

UNIT - IV

Ring Homomorphism's: Definition and Examples – Properties of Ring-Homomorphism's-The Field of Quotients Polynomial Rings: Notation and Terminology.

Text: Joseph A Gallian, Contemporary Abstract algebra (9th edition)

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - V Semester – V Paper (Advanced) (w.e.f. 2017-18)

(EARLIER CBCS)

LINEAR ALGEBRA

UNIT – I

Vector spaces, General properties of vector spaces, subspaces, Algebra of subspaces, linear combination of vectors. Linear span, linear sum of two subspaces, linear independence of vectors, Basis of vector space. Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace.

UNIT - II

Linear transformations, linear operators, Range and null space of linear transformations, Rank and nullity of linear transformations, linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

UNIT – III

The ad-joint or transpose of a linear transformation, Sylvester's law of nullity, characteristic values and characteristic vectors. Cayley Hamilton Theorem, Diagonalizable operators.

UNIT - IV

Inner product spaces, Euclidean and Unitary spaces. Norm or length of a vector, Schwartz inequality, Orthogonally, Orthonormal set. Complete orthonormal set, Gram – Schmidt orthogonal process.

Prescribed text book:

"Linear Algebra" by J.N.Sharma and A.R.Vasista Krishna Prakasham Mandir Meeru 250002.

Reference books:

1. "Linear Algebra" by Kenneth Hoffman and Ray Kunze, Pearson Educatoin (low priced edition), New Delhi.
2. "Linear Algebra" by Stephen H.Friedberg Prentice Hall of India Pvt.Ltd. 4th edition 2007.

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - V Semester – VI (a) Paper (Elective) w.e.f 2017-18

(EARLIER CBCS)

NUMERICAL ANALYSIS - I

UNIT - I

Errors in Numerical Computations: Numbers and their Accuracy, Errors and their computation, Absolute, Relative and Percentage errors, A general formula, Error in a series function. Solution of Algebraic and Transcendental Equations by bisection method, the Iteration method.

UNIT - II

The method of False position, Newton – Raphson method, Generalized Newton-Raphson, Ramanujan's method, Muller's method.

UNIT - III

Errors in polynomial interpolation, Forward difference, Backward differences, Central differences, Symbolic relations, Detection of errors by use Difference Tables, formula of a polynomial, Newton's formula for interpolation formula.

UNIT - IV

Gauss's central difference formula, Strilings central difference formula, Interpolation with unevenly spaced points Langrange's formula, Error in Langrange's formula, Derivation of governing equations, End conditions, Divided differences and their properties, Newton's general interpolation.

Prescribed text book:

Scope as in "Introductory method of Numerical Analysis" by S.S.Sastry, Prentice Hall India (4th Edition)

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - V Semester – VI (b) Paper (Elective) w.e.f. 2017-18

(EARLIER CBCS)

LAPLACE TRANSFORMS

UNIT – I

Definition of Laplace transform, linearly property, piecewise continuous function, Existence of Laplace transform, Functions of exponential order and of class A, First and second shifting theorems of Laplace transform, change of scale property, Laplace transform of derivatives, final and initial value theorems, Laplace transform of integrals, multiplication by t, division by t.

UNIT - II

Laplace transform of periodic functions and error function. Beta function and Gamma functions. Definition of inverse Laplace transform, linearity property, first and second shifting theorems of inverse Laplace transform, change of scale property, division by p,

UNIT - III

Convolution theorem, Heavisides expansion formula , Application of Laplace transform to the solution of ordinary differential equations with constant coefficients.

UNIT - IV

Application of Laplace transform to the solutions of ordinary differential equations. with variable coefficients. Simultaneous ordinary differential equations, partial differential equations.

Prescribed Text Book:

Scope as in "integral transform" by A.R.Vasistha and Dr.K.Gupta published by Krishna Prakashan Media Pvt.Ltd., Meerut.

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - VI Semester – VII Paper (Skill) w.e.f. 2017-18

(EARLIER CBCS)

MULTIPLE INTIGRALS AND VECTOR CALCULUS

UNIT – I

Multiple integrals: Introduction, the concept of a plane. Curve, line integral-sufficient condition for the existence of the integral. The area of a subset of R^2. Calculation of double integrals. Jordan curve, Area, Change of the order of integration.

UNIT – II

Double integral as a limit, change of variable in a double integration. Lengths of curves, surface areas, Integral expression for the length of a curve surfaces, surface areas.

UNIT – III

Vector differentiation. Ordinary derivatives of vectors, Space curves, Continuity, Differentiable, Gradient, Divergence, Curl operation. Formula involving these operators.

UNIT – IV

Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and application of these theorems.

Prescribed Text Book:

1. "A course of mathematical analysis" by Santhi Narayana and P.K.Mittal, S.Chand publication (Chapter 16 and 17).
2. "Vector Analysis" by Murray R.Spiegel, Schaum series publishing Company (chapters 3, 4, 5, 6 and 7).

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - VI Semester – VIII (a) Paper (Elective) w.e.f. 2017-18

(EARLIER CBCS)

NUMERICAL ANALYSIS – II

UNIT – I

Curve fitting: Least-squares curve fitting procedures, fitting a straight line, non linear curve fitting, curve fitting by a sum of exponentials.

UNIT - II

Numerical differentiation, errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration, Trapezoidal rule, Simpson's 1/3-rule, Simpson's 3/8-rule, Boole's and Weddle's rule.

UNIT - III

Linear systems of equations, Solutions of linear systems – Direct methods, Matrix inversion method, Gaussian elimination method, Method of factorization, Iterative methods, Jacobi's method, Gauss-siedal method.

UNIT - IV

Numerical solutions of ordinary differential equations: Introductoin, solution by Taylor's series, Picard's method of successive approximations. Euler's method, Modified Euler's method, Runge-Kutta method, Predictor-corrector methods, Milne's method.

Prescribed Text Book:

Scope as in "Introductory Methods of Numerical Analysis" by S.S.Sastry, Prentice Hall India (4th Edition)

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SYLLABUS FOR MATHEMATICS

B.Sc. III Year - VI Semester – VIII (b) Paper (Elective) w.e.f. 2017-18

(EARLIER CBCS)

FOURIER ANALYSIS

UNIT – I

Fourier series, theorem, Dirichlet's conditions. Fourier series for even and odd functions. Half range Fourier series, other forms of Fourier series.

UNIT - II

Dirichlet's conditions, Fourier integral formula (without proof). Fourier transform, Inverse Theorem for Fourier transform. Fourier sine and cosine transforms and their inversion formula. Linearity property of Fourier transform, change of scale property, Shifting theorem, Modulation theorem.

UNIT - III

Convolution theorem of Fourier transforms, Parseval's identity, Finite Fourier cosine transform, Inversion formula for cosine transform.

UNIT - IV

Application of Fourier transform to initial and boundary value problems.

Prescribed Text Book:

1. Scope as in "A course of mathematical analysis" by Santhi Narayana and P.K.Mittal published by S.Chand and company (chapter 10).

2. Scope as in "Integral transform" by A.R.Vasistgha and Dr.K.Gupta published by Krishna Prakashan Media Pvt.Ltd., Meerut.

13/10/17

Faculty of Science

B.Sc. I/II/III/IV/V&VI Semester Examination,

MATHEMATICS MODEL PAPER (CBCS)

Time: 2 ½ Hrs. Max.Marks: 70

SECTION - A (5x 2 = 10)

Answer the following questions. (At least one question from each section)

1.

2.

3.

4.

5.

SECTION - B (4 x 5 = 20)

Answer any FOUR of the following questions. (At least one question from each section)

6.

7.

8.

9.

10.

11.

SECTION - C (4 x 10= 40)

Answer the following questions.

12. (a) Unit - I

(OR)

(b) Unit - I

13. (a) Unit - II

(OR)

(b) Unit - II

14. (a) Unit - III

(OR)

(b) Unit- III

15. (a) Unit - IV

(OR)

(b) Unit - IV

13/10/17

Faculty of Science

B.Sc. **III Yr. VI** Semester-End Examination, Model Paper

MATHEMATICS - VII (CBCS)

Time: 2 ½ Hrs. Max.Marks: 70

SECTION - A **(5x 2 = 10)**

Answer the following questions.

1. Define double integral.
2. If A and B are irrotational prove that AXBis solenoidal.
3. Prove that $\int_c (axi+byj+czk).Nds = (a+b+c)V$.
4. If $F = yi = zj + xk$ and C is the closed curve bounded by the circle $x^2+y^2=1$, Z=0. Find $\int_c F.dr$.
5. Define curl of a vector.

SECTION - B **(4 x 5 = 20)**

Answer any FOUR of the following questions.

6. Show that $\nabla^2\left(\frac{1}{r}\right)=0$.
7. If $a = x+y+z$, $b = x^2+y^2+z^2$, $c = xy+yz+zx$ prove that $[\nabla a \nabla b \nabla c]=0$.
8. Evaluate $\int_c F.dr$ where $\overline{F} = -3x^2\bar{i}+5xy\bar{j}$ and C is the curve in the xy-plane $y = 2x^2$ from (0,0) to (1,2).
9. Find the surface area of the sphere given by $x = a\ Sin\theta Cos\varphi$, $y = aSin\theta Sin\varphi$, $z = aCos\theta$ where $0 \le \theta \le \Pi$, $0 \le \varphi \le \Pi$.
10. Evaluate $\iint xy(x+y)dxdy$ over the area between $y = x^2$ and $y = x$.
11. Evaluate $\int_c (3x+4y)dx+(2x-3y)dy$ whereC is a circle $x^2+y^2=4$.

SECTION - C **(4 x 10= 40)**

Answer the following questions.

12. (a) Evaluate $\int_c (x+y^2)dx+(x^2-y)dy$ taken in the clockwise sense along the closed curve C formed by $y^2 = x$ and $y = x$ between (0,0) and (1,1).

(OR)

(b) Evaluate the integral $\int_0^1 dx \int_0^{\sqrt{1-x^2}} \frac{dy}{(1+e^y)(\sqrt{(1-x^2-y^2)}}$.

Contd....2nd page

.13. (a) Show that he value of the integral $\iint (1-x-y)^3 x^{1/2} y^{1/2} dxdy$ taken over the interiror of the triangle whose vertices are the origin and the points (0,1) and (1,0) is $\frac{\Pi}{180}$.

(OR)

(b) Find the area of the surface of the paraboloid $x^2 + y^2 = az$ which lies between the planes $z = 0$ and $z = a$.

14. (a) Prove that $\nabla X(\nabla XA) = \nabla(\nabla.A) - \nabla^2 A$.

(OR)

(b) Define divergence and curl of a vector point function if $A = x^2 y\bar{i} - 2xz\bar{j} + 2yz\bar{k}$. Find $curl(curlA)$.

15. (a) Evaluate $\iint_S F.Nds$ where $F = 18zi - 12j + 3yk$ and S is the part of the plane $2x + 3y + 6z = 12$ located in the first octant using Gauss divergence theorem.

(OR)

(b) State and prove Stoke's theorem.

Faculty of Science

B.Sc. **III Yr. VI** Semester-End Examination, Model Paper

MATHEMATICS - VIII (CBCS)

Time: 2 ½ Hrs. Max.Marks: 70

SECTION - A (5x 2 = 10)

Answer the following questions.

1. Write normal equations to fit a straight line.
2. Write newton's forward interpolation formula to find $\frac{dy}{dx}$ at $x = x_0$.
3. Write trapezoidal rule.
4. Write Boole's Rule.
5. Write second order Runge-kutta formula.

SECTION - B (4 x 5 = 20)

Answer any FOUR of the following questions.

6. Derive the normal equations to fit an exponential function of the form $y = ax^b$.
7. Find the value of $\frac{d}{dx}[J_0(x)]$ at $x = 0.1$ from the following table.

x	0	0.1	0.2	0.3	0.4
y=f(x)	1.0000	0.9775	0.9900	0.9776	0.9604

8. Derive the Simson's $\frac{1}{3}$ rule.
9. Explain matrix inverse method.
10. Given that $y' = -y$ with the condition $y(0) = 1$, compute $y(0.04)$ by using Euler's mehod.
11. Given the differential equation $y'' - xy' - y = 0$ with the conditions $y(0) = 1$ and $y'(0) = 0$ use Taylor's series method to determine the value of $y(0.1)$.

SECTION - C (4 x 10= 40)

Answer the following questions.

12. (a) Derive Normal equations for fitting asecond degree polynomial $y = a + bx + cx^2$ by using least square approximation.

(OR)

(b) Determine the constants a and b by the least squares method such that $y = ae^{bx}$, fits the following data.

x	1.0	1.2	1.4	1.6
e^x	40.170	73.196	133.372	243.02

.13. (a) A function $y = f(x)$ is defined as follows.

x	1.0	1.05	1.10	1.15	1.20	1.25	1.30
y=f(x)	1.0	1.025	1.049	1.072	1.095	1.118	1.140

Compute the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.05$.

Contd....2nd page

(OR)

(b) Evaluate $\int_{-2}^{2} \frac{t}{5+2t}\,dt$ using Trapezoidal rule with 8 strips.

14. (a) Solve the following system of equations by using Gauss - Jordan method.

$2x+y+z=10, 3x+2y+3z+18, x+4y+9z=16$

(OR)

(b) Explain to solve the system of equations $a_{11}x_1+a_{12}x_2+a_{13}x_3=b_1, a_{21}x_1+a_{22}x_2+a_{23}x_3=b_2$, $a_{31}x_1+a_{32}x_2+a_{33}x_3=b_3$.

15. (a) Using Euler's modififed method find y(0,1) given that $\frac{dy}{dx}=x^2+y, y(0)=1$.

(OR)

(b) Given $\frac{dy}{dx}=1+y^2$, where y = 0 when x = 0, find y (0.2) by using fourth order Runge-kutta method.

Faculty of Science

B.Sc. **III Yr. V** Semester End Examination, Model Paper

MATHEMATICS - V (CBCS)

Time: 2 ½ Hrs. Max.Marks: 70

SECTION - A (5x 2 = 10)

Answer the following questions.

1. Define a vector space.
2. Define coordinates of a vector in a vector space.
3. Define null space (or) Kernel of a linear transformation.
4. Show that the two matrices A, $C^{-1}AC$ have the same eigen values.
5. If u+v and u-v are two orthogonal vectors in a real inner product space prove that $\|u\| = \|v\|$.

SECTION - B (4 x 5 = 20)

Answer any FOUR of the following questions.

6. Prove that the set of solution (x,y,z) of the equation $x + y + 2z = 0$ is a subspace of the vector space $R^3(R)$.
7. Verify the vectors $\{(1,-2,1),(2,1,-1),(7,-4,1)\}$ are linearly independent (or) dependent.
8. Is the mapping $T : R^3 \to R^2$ defined by $T(x,y,z) = (|x|,0)$ a linear transformation?
9. If the matrix A is non-singular, show that the eigan values of A^{-1} are the reciprocals of the eigen values of A.
10. State and prove Parallelogram law.
11. Show that the vectors α, β in an unitary space V(C) are orthogonal iff $\|a\alpha + b\beta\|^2 = |a|^2\|d\|^2 + |b|^2\|\beta\|^2 \forall a,b \in c$.

SECTION - C (4 x 10= 40)

Answer the following questions.

12. (a) A non empty subset W of a vector space V is a subspace of V if and only if $\forall a,b \in F, \forall \alpha,\beta \in W \Rightarrow a\alpha + b\beta \in w$.

(OR)

(b) Let $W_1 = \{(a,b,c,d)/b-2c+d=0\}$ and $W_2 = \{(a,b,c,d)/a=d, b=2c\}$ are subspaces of $R^4(R)$. Find the basis and dimensions of (i) W_1 (ii) W_2 (iii) $W_1 \cap W_2$ and hence find $\dim(W_1 + W_2)$.

.13. (a) State and prove Rank nullity theorem.

(OR)

(b) $T : V_3(R) \to V_3(R)$ is a linear operator defined by $T(e_1) = e_1 + e_2$, $T(e_2) = e_2 + e_3$, $T(e_3) = e_1 + e_2 + e_3$ show that T is non-singular and find its inverse where $\{e_1, e_2, e_3\}$ is a standard basis of $V_3(R)$.

14. (a) Find the eigen values and corresponding eigen vectors of a matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix}$.

(OR)

(b) Show that a square matrix A of order n over a field F is diagonalizable iff A has x linearly independent eigen vectors in $V_n(F)$.

15. (a) If α, β are two vectors in a complex inner product space with standard inner product then prove that $4 < \alpha, \beta >= \|\alpha+\beta\|^2 - \|\alpha-\beta\|^2 + i\|\alpha+i\beta\|^2 - i\|\alpha-i\beta\|^2$.

(OR)

(b) State and prove Bessel's inequality.

Faculty of Science

B.Sc. **III Yr. V** Semester End Examination, Model Paper

MATHEMATICS - VI (CBCS)

Time: 2 ½ Hrs. Max.Marks: 70

SECTION - A (5x 2 = 10)

Answer the following questions.

1. Define absolute and relative errors.
2. Derive that $\Delta\nabla = \nabla\Delta = \delta^2$.
3. State Newton's forward interpolation formula.
4. Prove that first divided difference of the function $f(x) = \frac{1}{x}$ with arguments a,b is $\frac{-1}{ab}$.
5. State method of false positoin interpolation formula.

SECTION - B (4 x 5 = 20)

Answer any FOUR of the following questions.

6. Explain Iteration method.
7. Explain Newton Raphson method.
8. Find a root of the equation $xe^x = 1$ using Ramanujan's method.
9. Using the method ofs separation of symbols show that

$$\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2}u_{x-2} + \ldots\ldots + (-1)^n u_{x-n}$$

10. Using Lagrange's interpolation formula, find the form of the function y(x) from the following table.

x	0	1	3	4
y	−12	0	12	24

11. Construct the divided difference table for the following table.

x	0	1	2	4	5
$y = f(x)$	2	3	12	78	147

SECTION - C (4 x 10= 40)

Answer the following questions.

12. (a) Find the root of the equation 2x=cosx+3 correct to three decimal places. Using Iteration method.

(OR)

(b) Find a real root of the equation $x^3 - 2x - 5 = 0$ using Bisection method.

13. (a) Find a root of the equation $x^3 - 2x - 5 = 0$ using Muller's method.

(OR)

(b) Find the root of the equation $x^3 - x - 4 = 0$ using false positoin method.

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14. (a) The population of a town in the decennial census was as given below. Estimate the population for the year 1895.

$Year: X$	891	1901	1911	1921	1931
$Population(thousands): y$	46	66	81	93	101

(OR)

(b) State and prove Newton's backward interpolation formula.

15. (a) State and prove Lagrange's interpolation formula.

(OR)

(b) Using Gauss's Forward formula, find the value of f(32) given that

$f(25) = 0.2707,\ f(30) = 0.3027$

$f(35) = 0.3386,\ f(40) = 0.3794$