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Affiliated to Adikavi Nannayya University
Thrice accredited by NAAC with 'A' Grade
Recognized by UGC as 'College with potential for Excellence'
I B.Sc Mathematics (for 2022-2025 batch, w.e.f 2020-21)
Paper I, Syllabus for I semester
Differential Equations

UNIT - I: (12 Hours)**Differential equations of first order and first degree** (10 Marks-2,5 Marks-2)
Additional Input:(Variables Separable, Homogeneous Differential equations.) Linear differential equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.

UNIT – II (12 Hours) **Differential Equations of first order but not of the first degree :** (10Marks-2, 5Marks- 1)
Orthogonal Trajectories, Equations solvable for p, Equations solvable for y, Equations solvable for x, Equations that do not contain x (or) y, Equations of the first degree in x and y- Clairaut's Equation.

UNIT-III: (12 Hours) **Higher order linear differential equations I** (10Marks-2, 5Marks-1)
Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.
General Solution of f(D)y=0
General Solution of f(D)y=Q, where Q is a function of x.

$\frac{1}{f(D)}$ is Expressed as partial fractions.

P.I. of f(D)y = Q when Q= be^{ax}
P.I. of f(D)y = Q when Q = b sin ax or b cos ax.

UNIT-IV: (12 Hours) **Higher order linear differential equations II** (10Marks-2, 5Marks-2)
Solution of the non-homogeneous linear differential equations with constant coefficients.
P.I. of f(D)y = Q when Q= bx^k
P.I. of f(D)y = Q when Q= $e^{ax}V$,where V is a function of x.
P.I. of f(D)y = Q when Q= xV ,where V is a function of x.
P.I. of f(D)y = Q when Q= x^mV ,where V is a function of x.

UNIT-V: (12 Hours) **Higher order linear differential equations III** (10Marks-2, 5Marks-2)
Method of Variation of Parameters; Linear Differential Equations with Non-Constant Coefficients, The Cauchy-Euler equation, Legendre's linear equations, miscellaneous differential equations.

Prescribed Text Book: (1) A Text Book of B.Sc Mathematics Volume-I (S.Chand & Company) (V.Venkateswara Rao, N.Krishnamurthy, B.V.S.S.Sarma, S.Anjaneya Sastry)

Reference Books: (1) Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
(2) Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- universities press.
(3) Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi- Second edition.

Suggested Activities:
Seminar/ Quiz/ Assignments

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SEMESTER-I
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Differential equations of first order and first degree	: 2 questions
Differential equations of the first order but not of the first degree	: 1 question
Higher order Linear differential equations I	: 1 question
Higher order Linear differential equations II	: 2 questions
Higher order Linear differential equations III	: 2 questions

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.

Each question carries 10 marks.

Note: Under SECTION-A (Q.NO:13) & SECTION-B (Q.NO:14) will be given from UNIT-III.

SECTION-A

Differential equations of the first order and first degree	: 2 questions
Differential equations of the first order but not of the first degree	: 2 questions
Higher order Linear differential equations I	: 1 question

SECTION-B

Higher order Linear differential equations I	: 1 question
Higher order Linear differential equations II	: 2 questions
Higher order Linear differential equations III	: 2 questions

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I B.Sc. Mathematics – Semester – I - Paper I
Differential Equations
Model Question Paper (for 2022-25 batch w. e. f 2020-2021)

Time: 3Hrs Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Solve $\left[y\left(1+\frac{1}{x}\right)+\text{Cos } y\right]dx+[x+\log x-x\sin y]dy=0.$
2. Solve $(1-x^2)\frac{dy}{dx}+2xy=x\sqrt{1-x^2}.$
3. Solve $x^2(y-px)=p^2y.$
4. Solve $(D^2-3D+2)y=\text{Cos } hx.$
5. Solve $(D^2-4D+3)y=x^3.$
6. Solve $(D^2+4)y=x\sin x$
7. $(x\sin x+\cos x)\frac{d^2y}{dx^2}-x\cos x\frac{dy}{dx}+y\cos x=0.$
8. Solve $(x^2D^2+2xD-12)y=x^3(\log x).$

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section. Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Solve $(2x^2y-3y^2)\,dx+(2x^3-12xy+\log y)dy=0.$
10. Solve $\frac{dy}{dx}+\frac{y}{x}=y^2\,x\sin x, x>0.$
11. Show that the family of confocal conics $\frac{x^2}{(a^2+\lambda)}+\frac{x^2}{(b^2+\lambda)}=1$ is self orthogonal, where λ is a parameter.
12. Solve $p^2+2py\cot x=y^2.$
13. Solve $(D^2+a^2)y=\sec ax.$

SECTION-B

14. Solve $(D^2+9)y=\cos^3 x.$
15. Solve $(D^2+3D+2)y=xe^x\sin x.$
16. Solve $(D^2-4D+1)y=e^{2x}\cos^2 x.$
17. Solve $(x+2)\frac{d^2y}{dx^2}-(2x+5)\frac{dy}{dx}+2y=(x+1)e^x$, given that $y=e^{2x}$ is a part of C.F.
18. Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=x^2e^x$ by the method of variation of parameters.

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Paper II, Syllabus for II semester
Solid Geometry

UNIT – I (12 hrs) : The Plane : (10 Marks-2,5 Marks-1)

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs) : The Line : (10Marks-2, 5Marks- 2)

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT – III (12 hrs) : Sphere : (10Marks-1, 5Marks-2)

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes.

UNIT – IV(12 hrs):Sphere&Cones : (10Marks-3, 5Marks-2)(**10 Marks Questions from Sphere 2 and Cone 1)**

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified form of the equation of two spheres, limiting points.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators.

UNIT – V (12 hrs) Cones: (10Marks-2, 5Marks-1)

Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle.

Prescribed Text Book: (1) A Text Book of B.Sc Mathematics Volume-I (S.Chand & Company)
(V.Venkateswara Rao, N.Krishnamurthy, B.V.S.S.Sarma, S.Anjaneya Sastry)

Reference Books :

1. Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, Published by S. Chand & Company Ltd. 7th Edition.
2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, Published by Wiley Eastern Ltd., 1999.
3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

Suggested Activities:

Seminar/ Quiz/ Assignments

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SEMESTER-II
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Unit-I (The Plane)	: 1 question
Unit-II(The Line)	: 2 questions
Unit-III(The Sphere)	: 2 questions
Unit-IV(The Sphere & Cones)	: 2 questions
Unit-V (The Cones)	: 1 question

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.

SECTION-A

Unit-I (The Plane)	: 2 questions
Unit-II (The Line)	: 2 questions
Unit-III (The Sphere)	: 1 question

SECTION-B

Unit-IV (The Sphere & Cone) (From Sphere-2, Cone-1)	: 3 questions
Unit-V (The Cone)	: 2 questions

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Solid Geometry
Model Question Paper (for 2022-25 batch w. e. f 2020-2021)

Time: 3Hrs Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Prove that the equation of the plane through the points (1,-2,4) and (3,-4,5) and parallel to x-axis is y +2z =6.
2. Find the equations of the straight line passing through the point (1,0,-1) and intersecting the lines $4x - y - 13 = 0 = 3y - 4z - 1; y - 2z + 2 = 0 = x - 5.$
3. Prove that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}; \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar, also find their point of intersection.
4. Find the equation of the sphere circumscribing the tetrahedron whose faces are x = 0, y = 0, z = 0 and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1.$
5. Find the pole of the plane x+2y+3z= 7 w.r.t the sphere $x^2 + y^2 + z^2 - 2x - 4y - 6z + 11 = 0.$
6. Find the equation of the sphere through the circle $x^2 + y^2 + z^2 - 2x + 3y - 4z + 6 = 0,$ 3x-4y+5z-15=0 and cutting the sphere $x^2 + y^2 + z^2 + 2x + 4y - 6z + 11 = 0$ orthogonally.
7. Find the equation to the cone whose vertex is (1,1,0) and whose guiding curve is $y = 0,$ $x^2 + z^2 = 4.$
8. Show that the reciprocal cone of $ax^2 + by^2 + C^2 = 0$ is the cone $\frac{x^2}{a} + \frac{y^2}{b} + \frac{z^2}{c} = 0.$

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section. Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Find the equations of the planes bisecting the angles between the planes 3x-6y+2z+5=0, 4x-12y+3z-3=0 also point out which the plane bisects the acute angle.
10. A variable plane is at a constant distance p from the origin and meets the axis in A,B,C show that the locus of the centroid of the tetrahedrom OABC is $x^{-2} + y^{-2} + z^{-2} = 16p^{-2}.$
11. Find the image of the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ in the plane x+y+z=1.
12. Find the shortest distance and equations of the line S.D between the lines 3x-9y+5z=0=x + y – z and 6x+8y+3z-10 = 0 = x+2y+z -3.
13. Find the equations of the spheres passing through the circle $x^2 + y^2 = 4, z = 0$ and is intersected by the plane $x + 2y + 2z = 0$ in a circle of radius 3.

SECTION-B

14. Show that the two circles $x^2 + y^2 + z^2 - y + 2z = 0, x - y + z = 2$ and $x^2 + y^2 + z^2 + x - 3y + z - 5 = 0, 2x - y + 4z - 1 = 0$ lie on the same sphere and find its equation.
15. If r_1, r_2 are the radii of two orthogonal spheres, then show that the radius of the circle of their intersection is $\frac{r_1 r_2}{\sqrt{(r_1^2 + r_2^2)}}$.
16. Prove that the angle between the lines of intersection of the plane x+y+z=0 with the cone ayz+bzx+cxy=0 is $\frac{\pi}{3}$ if $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$
17. Show that the equation of quadric cone which contains the three coordinate axes and the lines in which the plane x-5y-3z=0 cuts the cone $7x^2 + 5y^2 - 3z^2 = 0$ is yz+10zx+18xy=0.
18. Find the equation of the right circular cone whose vertex is the origin, axis as the line $x = t, y = 2t, z = 3t$ and whose semi-vertical angle is 60^0.

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II B.Sc Mathematics (for 2021-2024 batch, w.e.f 2021-22)
Paper III, Syllabus for III semester
Abstract Algebra

UNIT – 1 : (10 Hrs) Groups(10 Marks-2, 5 Marks-1)

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group. Composition tables with examples.

UNIT – 2 : (14 Hrs) Subgroups, Co-Sets and Lagrange's Theorem
(10 Marks-2, 5 Marks-2)

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroups.

Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT –3 : (12 Hrs) Normal Subgroups(10 Marks-2, 5 Marks-2)

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

Homomorphism:

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

UNIT – 4 : (10 Hrs) Permutation Group: (10 Marks-2, 5 Marks-2)

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

Cyclic Groups :-

Definition of cyclic group – elementary properties – classification of cyclic groups.

UNIT – 5 : (14 Hrs) Rings:(10 Marks-2, 5 Marks-1)

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

Prescribed Text Book: A Text Book of B.Sc Mathematics Volume-II (S.Chand & Company)
(V.Venkateswara Rao, N.Krishnamurthy, B.V.S.S.Sarma, S.Anjaneya Sastry)

Reference Books :

1. A. First course in Abstract Algebra, by J.B. Fraleigh Published by Narosa Publishinghouse.
2. Modern Algebra by M.L. Khanna.

Suggested Activities:

Seminar/ Quiz/ Assignments

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SEMESTER-III
BLUE PRINT

Max. Marks:75

Time: 3Hrs.

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Groups	: 1 question
Subgroups, Co-sets & Lagrange's theorem	: 2 question
Normal Sub groups & Homomorphism	: 2 questions
Permutations and Cyclic groups	: 2 questions
Rings	: 1 questions

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.

SECTION-A

Groups	: 2 questions
Subgroups, Co-sets & Lagrange's theorem	: 2 questions
Normal Subgroups	: 1 question

SECTION-B

Homomorphisms	: 1 question
Permutations and Cyclic groups	: 2 questions
Rings	: 2 questions

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II B.Sc. Mathematics – Semester – III - Paper III
Abstract Algebra
Model Question Paper (for 2021-24 batch, w. e. f 2021-2022)

Time: 3Hrs Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Show that the set Q^+ of all positive rational numbers forms an abelian group under the composition "o" defined by $a \circ b = \frac{ab}{3} \forall a, b \in Q^+$
2. If H is any subgroup of a group G, then prove that $H^{-1}=H$.
3. Prove that any two left (right) co-sets of a subgroup are either disjoint or identical.
4. Prove that every sub group of an abelian group is normal.
5. Let G be a multiplicative group and $f : G \to G$ such that for $a \in G$, $f(a)=a^{-1}$, then prove that f is one-one onto and f is homomorphism iff G is commutative.
6. Find the order of the cycle (1 4 5 7).
7. If G is a finite group of order n and if $a \in G$, then prove that $a^n=e$, where 'e' is identity in G.
8. Prove that every Boolean ring is abelian.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Prove that in a group G, for a, b, x, $y \in G$ the equation $ax=b$ and $ya=b$ have unique solutions.
10. Define Order of an element of a group. In a group G for a, $b \in G$, $O(a)=5$, $b \neq e$ and $aba^{-1} = b^2$, then find O(b).
11. Prove that a non-empty finite subset of a group G which is closed under multiplication is a subgroup of G.
12. Prove that a subgroup H of a group G is a normal subgroup of G iff the product of two right cosets of H in G is again a right cost of H in G.
13. Prove that a subgroup H of a group G is a normal subgroup of G iff each left co-set of H in G is a right co-set of H in G.

SECTION – B

14. Let G be a group and G^1 be a non empty set. If there exists a mapping f of G onto G^1 such that $f(ab)=f(a)f(b)$ for $a,b \in G$, then prove that G^1 is a group.
15. If f=(1 2 3 4 5 8 7 6), g=(4 1 5 6 7 3 2 8) are cyclic permutations, then show that $(fg)^{-1}=g^{-1}f^{-1}$.
16. Prove that a group of prime order is cyclic.
17. Prove that the set $Z[i] = \{a + bi \mid a, b \in Z, i^2 = -1\}$ of Gaussian integers is an integral domain w.r.t addition and multiplication of numbers. Is it a Field ?
18. Prove that the characteristic of a field is either a prime or zero.

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Paper IV, Syllabus for IV semester
Real Analysis

UNIT – I (12 hrs) : REAL NUMBERS

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supreme property; intervals. **(No. Question is to be set from this portion)**

Real Sequences (10 Marks-2, 5 Marks-2)

Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence.

The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT –II (12 hrs) : INFINITIE SERIES(10 Marks-2, 5 Marks-2)

Series : Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Canchy's n^{th} root test or Root Test.
3. D-Alembert's Test or Ratio Test.
4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence, semi convergence.

UNIT – III (12 hrs) : CONTINUITY (10 Marks-1, 5 Marks-1)

Limits : Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. **(No. Question is to be set from this portion)**

Continuous functions : Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

UNIT – IV (12 hrs) : DIFFERENTIATION & MEAN VALUE THEOREMS

(10 Marks-2, 5 Marks-2)

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Role's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem.

ADDITIONAL INPUT:

Generalized Mean value Theorems - Taylor's Theorem(Statement Only), Maclaurin's Theorem(Statement only), Expansion of functions with different forms of remainders, Taylor's Maclaurins Series, power series representation of functions.

UNIT – V (12 hrs) : RIEMANN INTEGRATION(10 Marks-3, 5 Marks-1)

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Prescribed Text Book: A Text Book of B.Sc Mathematics Volume-II (S.Chand & Company)
(V.Venkateswara Rao, N.Krishnamurthy, B.V.S.S.Sarma, S.Anjaneya Sastry)

REFERENCE TEXT BOOKS :

1. "Introduction to Real Analysis" by RABERT g BARTELY and .D.R. SHERBART Published by John Wiley.
2. Elements of Real Analysis on per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisinghania Published by S. Chand & Company Pvt. Ltd., New Delhi.

Suggested Activities:

Seminar/ Quiz/ Assignments

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SEMESTER-IV
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Real Sequences	: 2 questions
Infinite Series	: 2 questions
Continuity	: 1 question
Differentiation	: 2 questions
Riemann Integration	: 1 question

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.

SECTION-A

Real Sequences	: 2 questions
Infinite Series	: 2 questions
Continuity	: 1 question

SECTION-B

Differentiation & Generalized Mean value theorems	: 2 questions
Riemann Integration	: 3 questions

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II B.Sc. Mathematics – Semester –IV - Paper IV
Real Analysis
Model Question Paper (for 2021-2024 batch, w.e.f 2021-22)

Time: 3Hrs Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Prove that every convergent sequence is a Cauchy sequence.
2. Prove that $\lim\left[\frac{1}{(n+1)^2}+\frac{1}{(n+2)^2}+\cdots+\frac{1}{(n+n)^2}\right]=0$
3. Test for the convergence of $\sum_{n=1}^{\infty}\frac{2^n-2}{2^n+1}x^n$, x>0
4. Test for the convergence of $\sum_{n=2}^{\infty}\frac{\log n}{2n^3-1}$
5. Let f:R→R be such that $f(x)=\frac{e^{\frac{1}{x}}-e^{\frac{-1}{x}}}{e^{\frac{1}{x}}+e^{\frac{-1}{x}}}$ if x ≠ 0 and f(0)=1 discuss the continuity at x=0.
6. If f:[a,b]→R is derivable at c∈[a,b], then prove that f is continuous at c.
7. Prove that tan x > x > sin x ∀ x ∈ $(0,\frac{\pi}{2})$.
8. Prove that f(x) = sinx is integrable on $[0,\frac{\pi}{2}]$ and $\int_0^{\frac{\pi}{2}}\sin dx=1$.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section. Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Prove that a monotone sequence is convergent iff it is bounded.
10. State and prove Cauchy's general principle of convergence.
11. State and prove D-Alembert's test.
12. State and prove Cauchy's n^{th} root test.
13. Examine the continuity of f defined by f(x) = |x| + |x − 1|at x=0,1.

SECTION-B

14. State and prove Darboux's theorem.
15. Using Lagrange's theorem, show that $x>\log(1+x)>\frac{x}{x+1}\forall x>0$.
16. If f: [a, b] → R is monotonic on [a, b], then prove that f is integrable on [a, b].
17. State and prove First mean value theorem.
18. Prove that $\frac{\pi^3}{24}\le\int_0^{\pi}\frac{x^2}{5+3\cos x}dx\le\frac{\pi^3}{6}$.

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Paper V, Syllabus for IV semester

LINEAR ALGEBRA

UNIT – I (12 hrs) : Vector Spaces-I(10Marks-2, 5Marks-2)

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –II (12 hrs) : Vector Spaces-II(10Marks-2, 5Marks-1)

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT –III (12 hrs) : Linear Transformations (10Marks-2, 5Marks-2)

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT –IV (12 hrs) : Matrix(10Marks-2, 5Marks-1)

Linear Equations, Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley – Hamilton Theorem.

UNIT –V (12 hrs) : Inner product space(10Marks-2, 5Marks-2)

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Prescribed Text Books:

(1) A Text Book of B.Sc Mathematics Volume-III (S.Chand & Company)
(V.Venkateswara Rao, N.Krishnamurthy, B.V.S.S.Sarma, S.Anjaneya Sastry)

Reference Books :

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut- 250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on "Applications of Linear algebra Through Computer Sciences"

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SEMESTER-IV
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Vector Spaces-I	: 2 questions
Vector Spaces – II	: 1 question
Linear Transformations	: 2 questions
Matrix	: 1 question
Inner Product Spaces	: 2 questions

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.

Note: Under SECTION-A (Q.NO:13) & SECTION-B (Q.NO:14) will be given from UNIT-III.

SECTION-A

Vector Spaces-I	: 2 questions
Vector Spaces-II	: 2 questions
Linear Transformations	: 1 question

SECTION-B

Linear Transformations	: 1 question
Matrix	: 2 questions
Inner Product Spaces	: 2 questions

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III B.Sc. Mathematics – Semester IV - Paper V
Linear Algebra
Model Question Paper (for 2021 - 2024 batch w. e. f 2021-2022)

Time: 3Hrs Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Prove that the intersection of any two sub spaces of vector space is also a subspace.
2. Determine whether the set of vectors {(1,-2,1),(2,1,-1),(7,-4,1)} are L.D or L.I.
3. Show that the set {(1,2,1),(2,1,0),(1,-1,2)} forms a basis of $V_3(F)$.
4. Show that the mapping $T:V_3(R)\rightarrow V_2(R)$ is defined by T(x,y,z) = (x-y, x-z) is a linear transformation.
5. Let U(F) and V(F) be two vector spaces and $T : U \rightarrow V$ is a linear transformation, then prove that the null space N(T) is a subspace of U(F).
6. Prove that square matrices A and A^1 have the same characteristic values.
7. If α, β are two linearly dependent vectors in an inner product space, then show that $|<\alpha,\beta>| = \|\alpha\|\|\beta\|$
8. Prove that in an inner product space any orthogonal set of non-zero vectors is linearly independent.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section. Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Let V(F) be a vector space. A non empty set $W \subseteq V$. Prove that the necessary and sufficient condition for W to be a subspace of V is a, $b \in F$ and $\alpha,\beta \in V \Rightarrow a\alpha+b\beta \in W$.
10. If W_1 and W_2 are two subspaces of a vector space V(F), then prove that $L(W_1 \cup W_2) = W_1 + W_2$.
11. Let V(F) be a finite dimensional vector space of a dimension n and W be the subspace of V, then prove that W is a finite dimensional vector space with $\dim W \leq n$.
12. Let W be a subspace of a finite dimensional vector space V(F), then show that $\dim \frac{V}{W} = \dim V - \dim W$.
13. Let U(F) and V(F) be two vector spaces and $S = \{\alpha_1, \alpha_2, \ldots, \alpha_n\}$ be a basis of U. Let $\{\delta_1, \delta_2 \ldots, \delta_n\}$ be a set of vectors in V, then prove that there exists a unique linear transformation $T : U \rightarrow V$ such that $T(\alpha_i) = \delta_i$ for $i = 1,2,\ldots,n$.

SECTION-B

14. Describe explicitly of the linear transformation $T : R^2 \rightarrow R^2$ such that T(2,3)=(4,5) and T(1,0)=(0,0).
15. Solve the system $\lambda x + y + z = 0, x + \lambda y + z = 0, x + y + \lambda z = 0$ if the system has non zero solutions only.
16. Find the Eigen values and eigen vectors of the matrix $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$
17. State and prove Bessel's inequality.
18. Apply Gram-Schmidt process to the vectors {(1,0,1), (1,0,-1), (0,3,4)} to obtain an orthonormal basis of $V_3(R)$ with the standard inner product.

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Paper VI , Syllabus for V semester
NUMERICAL METHODS

UNIT- I: (10 Marks -2)(5 Marks -2)

ADDITIONAL INPUT:

Errors in Numerical computations :

Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

Finite Differences and Interpolation with Equal intervals:

Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions, Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series. Newton's formulae for interpolation, Central Difference Interpolation Formulae.

UNIT- II: (10 Marks -2)(5 Marks -2)

Interpolation with Equal and Unequal intervals:

Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling's formula, Bessel's formula. Interpolation with unevenly spaced points, divided differences and properties, Newton's divided differences formula. Lagrange's interpolation formula, Lagrange's Inverse interpolation formula.

UNIT- III: (10 Marks -2)(5 Marks -1)

Numerical Differentiation:

Derivatives using Newton's forward difference formula, Newton's back ward difference formula, Derivatives using central difference formula, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function.

UNIT- IV: (10 Marks -2)(5 Marks -2)

Numerical Integration:

General quadrature formula one errors, Trapezoidal rule, Simpson's1/3– rule, Simpson's 3/8 – rule, and Weddle's rules, Euler – McLaurin Formula of summation and quadrature, The Euler transformation.

UNIT- V: (10 Marks -2)(5 Marks -1)

Numerical solution of ordinary differential equations:

Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge – Kutta methods.

PRESCRIBED TEXT BOOK:

1. Numerical Analysis by Dr. A Anjaneyulu, published by Deepti Publications.
2. S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055

Reference Books :

1. Numerical Analysis by S.S.Sastry, published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)
2. P.Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis. S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.
5. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

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SEMESTER-V
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Errors in Numerical computations & Finite Differences and Interpolation with Equal intervals	: 2 questions
Interpolation with Equal and Unequal intervals	: 2 questions
Numerical Differentiation	: 1 question
Numerical Integration	: 2 questions
Numerical solution of ordinary differential equations	: 1 question

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section. Each question carries 10 marks.

Note: Under SECTION-A (Q.NO:13) & SECTION-B (Q.NO:14) will be given from UNIT-III.

SECTION-A

Errors in Numerical computations & Finite Differences and Interpolation with Equal intervals	: 2 questions
Interpolation with Equal and Unequal intervals	: 2 questions
Numerical Differentiation	: 1 question

SECTION-B

Numerical Differentiation	: 1 question
Numerical Integration	: 2 questions
Numerical solution of ordinary differential equations	: 2 questions

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III B.Sc. Mathematics – Semester V - Paper VI
NUMERICAL METHODS
Model Question Paper (for 2020-2023 batch w.e.f 2022-2023)

Time: 3Hrs Max Marks:75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Evaluate the sum $s = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to four significant digits and find its absolute and relative errors.
2. Given $u_0 = 3, u_1 = 12, u_2 = 81, u_3 = 200, u_4 = 100, u_5 = 8$, find $\Delta^2 u_0$.
3. State and prove Stirling's formula
4. If $f(x) = \frac{1}{x}$ then find f (a,b).where f(a,b) is the first divided difference.
5. Using the following table compute $\frac{dy}{dx}$ at x=1.

x	1	2	3	4	5	6
y	1	8	27	64	125	216

6. Find the value of $\int_1^5 \log_{10} x \, dx$ taking 8 subintervals correct to 4 decimal places, by Trapezoidal rule.
7. Evaluate $\int_0^1 \frac{1}{1+x} dx$, correct to five decimal places by Euler Maclaurins formula.
8. Using Taylor's series expansion to find a solution of the differential equation $\frac{dy}{dx} = (0.1)(x^3 + y^3)$ with $y(0) = 1$ correct to 4 decimal places.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. If $u = \frac{5xy^2}{z^3}$, then find relative maximum error in u, given that $x = \Delta y = \Delta z = 0.001$ and $x = y = z = 1$.
10. Using Newton's Backward interpolation formula, compute f(7.5) of

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

11. State and prove Gauss backward interpolation formula.
12. Using Lagrange's interpolation formula, find f(10) of

x	5	6	9	11
f(x)	12	13	14	16

13. Find the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1$ to the given data

x	1	2	3	4	5	6
y	1	8	27	64	125	216

SECTION – B

14. Find the maximum and the minimum values of the function y = f(x) from the following data.

x	0	1	2	3	4	5
y	0	0.25	0	2.25	16	56.25

15. Find the value of integral $\int_0^1 \frac{1}{1+x^2} dx$ by Simpson's $\frac{1}{3}$rd rule .Hence obtain the approximate value of π.

16. Evaluate $\int_4^{5.2} \log x \, dx$ by using Weddle's rule.

17. Use Runge Kutta method of fourth order to find an approximate value of y when x=0.1and x=0.2 given that x=0 when y=1 and $\frac{dy}{dx} = x + y$

18. Using the Euler's modified method, find y(0.2) for $\frac{dy}{dx} = x + |\sqrt{y}|$ with y(0)=1.

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Paper VII , Syllabus for V semester
SPECIAL FUNCTIONS

Unit – 1:

Beta and Gamma functions, Chebyshev polynomials (10 Marks -2)(5 Marks -2)

Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions. Another form of Beta Function, Relation between Beta and Gamma Functions. Chebyshev polynomials, orthogonal properties of Chebyshev polynomials, recurrence relations, generating functions for Chebyshev polynomials.

Unit – 2: Power series and Power series solutions of ordinary differential equations (10 Marks -2)(5 Marks -1)

Introduction, summary of useful results, power series, radius of convergence, theorems on Power series, Introduction of power series solutions of ordinary differential equation , Ordinary and singular points, regular and irregular singular points, power series solution.

Unit – 3: Hermite polynomials (10 Marks -2)(5 Marks -2)

Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

Unit – 4: Legendre polynomials - (10 Marks -2)(5 Marks -1)

Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials. Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation (derivations not required) to show that $P_n(x)$, is the coefficient of h^n in the expansion of $(1 - 2xh + h^2)^{-\frac{1}{2}}$. Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

Unit – 5: Bessel's equation - (10 Marks -2)(5 Marks -2)

Definition, Solution of Bessel's equation, Bessel's function of the first kind of order n, Bessel's function of the second kind of order n. Integration of Bessel's equation in series form=0, Definition of $J_n(x)$, recurrence formulae for $J_n(x)$, Generating function for $J_n(x)$, orthogonally of Bessel functions.

Reference Books:

1. Dr.M.D.Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
2. J.N.Sharma and Dr.R.K.Gupta, Differential equations with special functions, Krishna Prakashan Mandir.
3. Shanti Narayan and Dr.P.K.Mittal, Integral Calculus, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
4. George F.Simmons, Differential Equations with Applications and Historical Notes, Tata McGRAW-Hill Edition, 1994.
5. Shepley L.Ross, Differential equations, Second Edition, John Willy & sons, New York, 1974. 6.

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SEMESTER-V
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Beta and Gamma functions, Chebyshev polynomials	: 2 questions
Power series and Power series solutions of ordinary differential equations	: 1 question
Hermite polynomials	: 2 questions
Legendre polynomials	: 1 question
Bessel's equation	: 2 questions

PART-II(5 x 10 M= 50 M)

Answer any FIVE questions. Choosing atleast TWO questions from each section.

Each question carries 10 marks.

Note: Under SECTION-A (Q.NO:13) & SECTION-B (Q.NO:14) will be given from UNIT-III.

SECTION-A

Beta and Gamma functions, Chebyshev polynomials	: 2 questions
Power series and Power series solutions of ordinary differential equations	: 2 questions
Hermite polynomials	: 1 question

SECTION-B

Hermite polynomials	: 1 question
Legendre polynomials	: 2 questions
Bessel's equation	: 2 questions

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MATHEMATICAL SPECIAL FUNCTIONS
Model Question Paper (for 2020-2023 batch w.e.f 2022-2023)

Time: 3Hrs Max Marks:75

PART-I

Answer any FIVE Questions, each question carries FIVE marks. 5x5M =25M

1. Compute $\Gamma\left(-\frac{1}{2}\right)$
2. Evaluate $\int_0^2 \frac{x^2 dx}{\sqrt{(2-x)}}$.
3. Find the radius of convergence of the power series $\sum \frac{(n+1)}{(n+2)(n+3)} x^n$.
4. Prove that $H_n^{II}(x) = 4n(n-1)H_{n-2}$
5. Prove that if $m < n$, $\frac{d^m}{dx^m}\{H_n(x)\} = \frac{2^m n!}{(n-m)!} H_{n-m}(x)$
6. Prove that $(2n+1)xP_n = (n+1)P_{n+1} + nP_{n-1}$
7. Show that $J_{-\frac{1}{2}}(x) = \sqrt{\left(\frac{2}{\pi x}\right)} \cos x$.
8. Prove that $J_2 = J_0{}^{11} - x^{-1}J_0^1$

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks. 5x10M = 50M

SECTION – A

9. Prove that $\beta(l,m) = \frac{\Gamma(l)\Gamma(m)}{\Gamma(l+m)}$.
10. Show that $2^n\Gamma\left(n+\frac{1}{2}\right) = 1.3.5 \ldots (2n-1)\sqrt{\pi}$
11. If a power series $\sum a_n x^n$ converges for $|x| < R$ and if a function f(x) is defined as $f(x) = \sum a_n x^n, |x| < R$, then $f(x) = \sum a_n x^n$ converges uniformly on $[-R+\in, R-\in]$ for every $\in > 0$.
12. Find the power series solution of the equation $(x^2-1)y^{II} + xy^I - xy = 0$ in powers of x (i.e., about x = o).
13. Prove that $\int_{-\infty}^{\infty} e^{-x^2} H_n(x)H_m(x)dx = \begin{cases} 0 & \text{if } m \neq n \\ 2^n\sqrt{\pi}\, n! & \text{if } m = n \end{cases}$

SECTION-B

14. Show that $\sum_{r=0}^{n} \frac{H_k(x)H_k(z)}{2^k k!} = \frac{H_{n+1}(y)H_n(x) - H_{n+1}(x)H_n(y)}{2^{n+1}n!(y-x)}$
15. Prove that $P_n(x) = \frac{1}{n!2^n}\frac{d^n}{dx^n}(x^2-1)^n$
16. Prove that(i) $\int_{-1}^{1} P_m(x)P_n(x)dx = 0$ if $m \neq n$(ii) $\int_{-1}^{1}[P_n(x)]^2 dx = \frac{2}{2n+1}$ if $m = n$
17. Prove that $J_n^I(x) = nJ_n(x) - xJ_{n+1}(x)$.
18. Prove that $\frac{d}{dx}[J_n^2 + J_{n+1}^2] = 2\left(\frac{n}{x}J_n^2 - \frac{n+1}{x}J_{n+1}^2\right)$

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SRI Y.N.COLLEGE(Autonomous), Narsapur
Affiliated to Adikavi Nannayya University
Thrice accredited by NAAC with 'A' Grade
Recognized by UGC as 'College with potential for Excellence'

LIFE SKILL COURSE - ANALYTICAL SKILLS

Syllabus for BA, B.Sc, B.Com Programmes

Semester – III (for 2021 -24 admitted batch, w.e.f. 2021-22)

(Total 30 Hrs)

Course Objective: Intended to inculcate quantitative analytical skills and reasoning as an inherent ability in students.

Course Outcomes:

After successful completion of this course, the student will be able to;

1) Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.
2) Acquire competency in the use of verbal reasoning.
3) Apply the skills and competencies acquired in the related areas
4) Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

UNIT – I :

Arithmetic ability: (10 Questions)

Algebraic operations BODMAS, Fractions, Divisibility rules, LCM & GCD (HCF).

Verbal Reasoning : (10 Questions)

Number Series, Coding & Decoding, Blood relationship, Clocks, Calendars.

UNIT – II :

Quantitative aptitude (10 Questions)

Averages, Ratio and proportion, Problems on ages, Time-distance – speed.

Business computations (10 Questions)

Percentages, Profit &loss, Partnership, simple compound interest.

UNIT – 3:

Data Interpretation: (2 Questions)

Tabulation, Bar Graphs, Pie Charts, Line Graphs, Venn diagram.

Reference Books:

1. Quantitative Aptitude for Competitive Examination by R S Agrawal, S.Chand publications.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.
5. Old question Paper of the exams conducted by (Wipro, TCS, Infosys, Etc) at their recruitment process, source-Internet.

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II B.Sc, B.A, B.Com
LIFE SKILL COURSE – ANALYTICAL SKILLS
Model Question Paper (for 2021-24 batch w. e. f 2021-2022)

Time: 2Hrs **Max Marks: 50**

Answer ALL the questions. Each question carries ONE mark. **50 x 1 =50M**

SECTION-A(Unit-I & II)

1. Solve 5172.49+378.352+ x = 9318.678
   (a) 7637.683 (b) 7367.368 (c) 3767.836 (d) 7763.638
2. Solve 0.014 x 0.014 = ?
   (a) 0.000196 (b) 0.00196 (c) 19.6 (d) 196
3. Find the value of $2-[2-\{2-2(2+2)\}]$
   (a) – 4 (b) 4 (c) 6 (d) None of these
4. Evaluate $\frac{8-[5-(-3+2)]\div 2}{|5-3|-|5-8|\div 3}$
   (a) 2 (b) 3 (c) 4 (d) 5
5. $\frac{4335}{4(?)24} \div 1\frac{7}{8} = \frac{289}{528}$ Find the missing digit in place of ' ? '
   (a) 1 (b) 2 (c) 8 (d) None of these
6. Which of the following has fractions in ascending order?
   (a) $\frac{2}{3},\frac{3}{5},\frac{7}{9},\frac{9}{11},\frac{8}{9}$ (b) $\frac{3}{5},\frac{2}{3},\frac{9}{11},\frac{7}{9},\frac{8}{9}$ (c) $\frac{3}{5},\frac{2}{3},\frac{7}{9},\frac{9}{11},\frac{8}{9}$ (d) $\frac{8}{9},\frac{9}{11},\frac{7}{9},\frac{2}{3},\frac{3}{5}$
7. The sum of all two digit numbers divisible by 5 is
   (a) 1035 (b) 1245 (c) 1230 (d) 945
8. The largest 4 digit number exactly divisible by 88 is
   (a) 9944 (b) 9768 (c) 9988 (d) 8888
9. Find the L.C.M of 16, 24, 36 and 54
   (a) 433 (b) 432 (c) 324 (d) 234
10. The L.C.M. of $\frac{1}{3},\frac{5}{6},\frac{2}{9},\frac{4}{27}$ is :
    (a) $\frac{1}{54}$ (b) $\frac{10}{27}$ (c) $\frac{20}{3}$ (d) None of these
11. 1, 9, 25, 49, ?, 121
    (a) 64 (b) 81 (c) 91 (d)100
12. 589654237, 89654237, 8965423, 965423, ?
    (a) 58965 (b) 65423 (c) 89654 (d) 96542
13. CIRCLE is related to RICELC in the same way as SQUARE is related to
    (a) QSUERA (b) QUSERA (c) UQSAER (d) UQSERA
14. In a certain code, BRAIN is written as * % + # × and TIER is written as $ # + %. How is RENT written in that code?
    (a) % × # $ (b) % # × $ (c) % + × $ (d) + × % $
15. B is the husband of P. Q is the only grandson of E, who is wife of D and mother-in-law of P. How is B related to D ?
    (a) Nephew (b) Cousin (c) Son-in-law (d) Son
16. E is the son of A. D is the son of B. E is married to C. C is B's daughter. How is D related to E?
    (a) Brother (b) Uncle (c) Father-in-law
    (d) Brother –in-law (e) None of these
17. How many times do the hands of a clock coincide in a day?
    (a) 20 (b) 21 (c) 22 (d) 24

18. How many times in a day, are the hands of a clock in straight line but opposite in direction?
(a) 20 (b) 22 (c) 24 (d) 48

19. What was the day of the week on 16th July, 1776?
(a) Monday (b) Wednesday (c) Tuesday (d) Saturday

20. On 6th march, 2005 Monday falls. What was the day of the week on 6th March, 2004.
(a) Sunday (b) Saturday (c) Tuesday (d) Wednesday

21. Find the average of all prime numbers between 30 and 50
(a) 40 (b) 41 (c) 55.5 (d) 39.8

22. A batsman makes a score of 87 runs in the 17th innings and thus increases his average by 3. Find his average after 17th inning.
(a)38 (b) 40 (c) 45 (d) 39

23. If $A : B = \frac{1}{2} : \frac{1}{8}$, $B : C = \frac{1}{3} : \frac{5}{9}$ and $C : D = \frac{5}{6} : \frac{3}{4}$, then the ratio A : B : C : D is :
(a) 4 : 6 : 8 : 10 (b) 6 : 4 : 8 : 10 (c) 6 : 8 : 9 : 10 (d) 8 : 6 : 10 : 9

24. If 0.75 : x : : 5 : 8, then x is equal to
(a) 1.12 (b) 1.20 (c) 1.25 (d) 1.30

25. Present ages of Sammer and Anand are in the ratio of 5: 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?
(a) 24 (b) 27 (c) 40 (d) Cannot be determined (e) None of these

26. Sachin is younger than Rahul by 4 years. If their ages are in the respective ratio of 7 : 9, how old is Sachin?
(a) 16 years (b) 18 years (c) 28 years
(d) cant be determined (e) None of these

27. A cyclist covers a distance of 750m in 2 min 30 sec. What is the speed in km/hr of the cyclist?
(a)18 km /hr (b) 20 km /hr (c) 22 km /hr (d) 25 km

28. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km / hr the time taken by it to cover the same distance will be :
(a) 10 min (b) 11 min 20 sec (c) 13 min (d) 13 min 20 sec

29. A thief steals a car at 2.30 p.m. and drives it at 60kmph. The theft is discovered at 3 p.m. and the owner sets off in another car at 75kmph. When will he overtake the thief?
(a) 4.30 p.m. (b) 4.45 p.m. (c) 5 p.m. (d) 5.15p.m.

30. A man's speed with the current is 15kmph and the speed of the current is 2.5kmph. The man's speed against the current is
(a) 8.5kmph (b) 9kmph (c) 10kmph (d) 12.5kmph

31. What is 15% of Rs.34?
(a) Rs. 3.40 (b) Rs.3.75 (c) Rs.4.50 (d) Rs.5.10

32. 65 % of ? = 20% of 422.50
(a) 84.5 (b) 130 (c) 139.425 (d) 200

33. If on selling 12 notebooks, a seller makes a profit equal to the selling price of 4 note books, what is his percent profit?
(a) $16\frac{2}{3}$ (b) 25 (c) 50 (d) Data inadequate (e) None of these

34. A, B and C enter into a partnership with a capital in which A's contribution is Rs.10,000. If out of a total profit of Rs.1000, A gets Rs.500 and B gets Rs.300, then C's capital is :
(a) Rs.4000 (b) Rs.5000 (c) Rs.6000 (d) Rs.9000

35. P and Q started a business investing Rs.85,000 and Rs.15,000 respectively. In what ratio the profit earned after 2 years be divided between P and Q respectively?
(a) 3 : 4 (b) 3 : 5 (c) 15 : 23 (d) 17 : 23 (e) None of these

36. Reena and Shaloo are partners in a business. Reena invests Rs. 35,000 for 8 months and Shaloo invests Rs.42,000 for 10 months. Out of a profit of Rs.31,750, Reena's share is :
(a) Rs.9471 (b) Rs.12,628 (c) Rs.18,040 (d) Rs.18,942

37. A sum of Rs.12,500 amounts to Rs.15,500 in 4 years at the rate of simple interest. What is the rate of interest?
(a) 3% (b) 4% (c) 5% (d) 6% (e) None of these

38. The differences between the simple interest received from two different sources on Rs.1500 for 3 years is Rs.13.50. The difference between their rates of interest is :
(a) 0.1 % (b) 0.2% (c) 0.3% (d) 0.4% (e) None of these

39. Find the compound interest on Rs.10,000 in 2 years at 4% per annum, the interest being compounded half-yearly.
(a) Rs.852.23 (b) Rs.824.32 (c) Rs.258.94 (d) Rs.843.16

40. Rs.800 becomes Rs.956 in 3 years at a certain rate of simple interest. If the rate of interest is increased by 4%, what amount will Rs.800 become in 3 years?
(a) Rs.1020.80 (b) Rs.1025 (c) Rs.1052
(d) Data inadequate (e) None of these

SECTION – B (Unit – III)
(Q.No 41 – 45)

Study the following table carefully and answer the questions given below.

Classification of 100 students based on the marks obtained by them in Physics and Chemistry in an Examination

Marks out of 50 / Subject	40 and Above	30 and Above	20 and Above	10 and Above	0 and Above
Physics	9	32	80	92	100
Chemistry	4	21	66	81	100
Average	7	27	73	87	100

41. The number of students scoring less than 40% marks in aggregate is:
(a)13 (b) 19 (c) 20 (d) 27 (e) 34

42. If at least 60% marks in Physics are required for pursuing higher studies in Physics, how many students will be eligible to pursue higher studies in Physics?
(a)27 (b) 32 (c) 34 (d) 41 (e) 68

43. What is the difference between the number of students passed with 30 as cut-off marks in Chemistry and those passed with 30 as cut-off marks in aggregate?
(a) 3 (b) 4 (c) 5 (d) 6 (e) 7

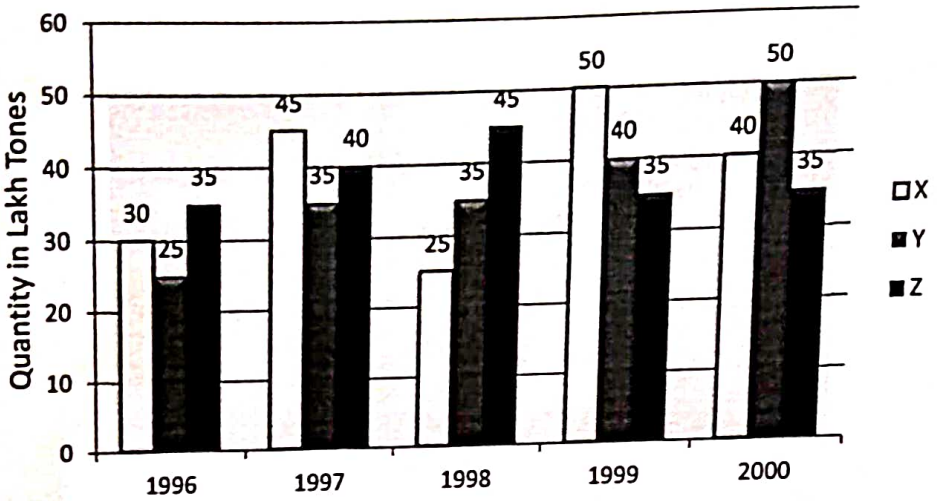
44. The percentage of the number of students getting at least 60% marks in Chemistry over those getting at least 40% marks in aggregate, is approximately:
(a) 21% (b) 27% (c) 29% (d) 31% (e) 34%

45. If it is known that at least 23 students were eligible for a symposium on Chemistry, the minimum qualifying marks in Chemistry for eligibility to Symposium would lie in the range :
(a) 40 -50 (b) 30-40 (c) 20-30 (d) Below 20 (e) Cannot be determined

(Q.No 46 – 50)

. The bar graph provided below gives the data of the production of paper (in lakh tones) by three different companies X,Y and Z over the years. Study the graph and answer the questions that follow.

Production of Paper (in lakh tones) by three companies X,Y and Z over the years



46. What is the difference between the production of Company Z in 1998 and Company Y in 1996?
(a) 2,00,000 tons (b) 20,00,000 tons (c) 20,000 tons (d) 2,00,00,000 tons
(e) None of these

47. What is the ratio of the average production of Company X in the period 1998-2000 to the average production of Company Y in the same period?
(a) 1 : 1 (b) 15 : 17 (c) 23 : 25 (d) 27 : 29 (e) None of these

48. What is the percentage increase in the production of Company Y from 1996 to 1999?
(a) 30% (b) 45% (c) 50% (d) 60% (e) 75%

49. The average production for five years was maximum for which company?
(a) X (b) Y (c) Z (d) X and Y both (e) X and Z both

50. In which year was the percentage of production of Company Z to the production of Company Y the maximum?
(a) 1996 (b) 1997 (c) 1998 (d) 1999 (e) 2000

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