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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 2019-2022 batch, w.e.f 2016-17)
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)
Linear differential equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.

UNIT – II (12 Hours) **Orthogonal Trajectories, Differential Equations of first order but not of the first degree :** (10Marks-2, 5Marks- 1)
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 when 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= $e^{ax}V$
P.I. of f(D)y = Q when Q= xV
P.I. of f(D)y = Q when Q= x^mV

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.

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 – Paper I
Differential Equations
Model Question Paper (for 2019-22 batch w. e. f 2016-2017)

Time: 3Hrs Max Marks: 75

PART-I

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

1. Solve $\left[y\left(1+\frac{1}{x}\right)+\text{Cos}\,y\right]dx+[x+\log x-x\,\text{sin}y]dy=0.$
2. Solve $(1-x^2)\frac{dy}{dx}+2xy=x\sqrt{1-x^2}.$
3. Solve $x^2(y-px)=p^2y.$
4. Solve $(D^2-3D+2)y=\text{Cosh}x.$
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 $(D^2+9)y=\cos^3x.$
15. Solve $(D^2+3D+2)y=xe^x\text{Sin}x.$
16. Solve $(D^2-4D+1)y=e^{2x}\cos^2x.$
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.

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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

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

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Solid Geometry
Model Question Paper (for 2019-22 batch w. e. f 2016-2017)

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 2018-2021 batch, w.e.f 2016-17)
Paper III, Syllabus for III semester
Abstract Algebra (Group Theory)

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-1**)**

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-1, 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.

UNIT – 4 : (10 Hrs) Homomorphism(10 Marks-2, 5 Marks-2**)**

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 – 5 : (14 Hrs) Permutations And Cyclic Groups(10 Marks-3, 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.

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-II
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Groups	: 1 question
Subgroups	: 1 question
Normal Sub groups	: 2 questions
Homomorphism	: 2 questions
Permutations and Cyclic groups	: 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.

SECTION-A

Groups	: 2 questions
Subgroups	: 2 questions
Normal Subgroups	: 1 question

SECTION-B

Homomorphism and Isomorphism of Groups	: 2 questions
Permutations and Cyclic groups	: 3 questions

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II B.Sc. Mathematics – Paper III
Abstract Algebra(Group Theory)
Model Question Paper (for 2018-21 batch, w. e. f 2016-2017)

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. If H is a subgroup of G and N is a normal sub group of G, then prove that (i) $H \cap N$ is a normal subgroup of H (ii) N is a normal subgroup of HN.
4. Prove that every sub group of an abelian group is normal.
5. Prove that every homomorphic image of an abelian group is abelian.
6. 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.
7. Find the order of the cycle (1 4 5 7).
8. 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

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 non empty complex H of a group G is a subgroup of G iff (i) $a \in H, b \in H \Rightarrow ab \in H$ (ii) $a \in H \Rightarrow a^{-1} \in H$.
13. 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.

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. Prove that the necessary and sufficient condition for a homomorphism f of a group G onto a group G^1 with Kernel K to be an isomorphism of G into G^1 is that K = { e }.
16. 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 $(fg)^{-1}=g^{-1}f^{-1}$.
17. Let S_n be a symmetric groups of n symbols and let A_n be the group of even permutations, then show that A_n is normal in S_n and $O(A_n)=\frac{1}{2}n!$
18. Prove that a group of prime order is cyclic.

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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

SEMESTER-III
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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(NAAC ACCREDITED 'A' GRADE COLLEGE)
NARSAPUR - 534 275

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II B.Sc. Mathematics – Paper IV
Real Analysis
Model Question Paper (for 2018-21 batch w. e. f 2016-2017)

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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III B.Sc Mathematics (for 2017-2020 batch, w.e.f 2017-18)
PaperV, Syllabus for V semester
RING THEORY & VECTOR CALCULUS

UNIT – 1 (12 hrs) Rings-I (10Marks-2, 5Marks-2)

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

UNIT – 2 (12 hrs) Rings-II(10Marks-2, 5Marks-2)

Definition of Homomorphism – Homomorphic Image – Elementary Properties of Homomorphism –Kernel of a Homomorphism – Fundamental theorem of Homomorhphism – Maximal Ideals – Prime Ideals.

UNIT –3 (12 hrs) Vector Differentiation (10Marks-2, 5Marks-2)

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators.

UNIT – 4 (12 hrs) Vector Integration (10Marks-2, 5Marks-1)

Line Integral, Surface Integral, Volume integral with examples.

UNIT – 5 (12 hrs) Vector Integration Applications (10Marks-2, 5Marks-1)

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Prescribed book:

(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. Abstract Algebra by J. Fralieh, Published by Narosa Publishing house.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. Vector Calculus by R. Gupta, Published by Laxmi Publications.
4. Vector Calculus by P.C. Matthews, Published by Springer Verlag publications.
5. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

Suggested Activities: Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

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SEMESTER-III
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Rings – I	: 2 questions
Rings – II	: 2 questions
Vector Differentiation	: 2 questions
Vector Integration	: 1 question
Vector Integration Applications	: 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

Rings – I	: 2 questions
Rings – II	: 2 questions
Vector Differentiation	: 1 question

SECTION-B

Vector Differentiation	: 1 question
Vector Integration	: 2 questions
Vector Integration Applications	: 2 questions

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III B.Sc. Mathematics – Paper V
RING THEORY AND VECTOR CALCULUS
Model Question Paper (for 2017-20 batch w. e. f 2017-2018)

Time: 3Hrs Max Marks: 75

PART-I

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

1. If R is a Boolean ring , then prove that (i) $a + a = 0 \forall a \in R$, (ii) $a + b = 0 \Rightarrow a = b$ and (iii) R is commutative under multiplication.
2. Prove that the intersection of two sub rings of a ring R is a sub ring of R.
3. If f is a homomorphism of a ring R into a ring R^1, then prove that Ker f is an ideal of R.
4. Prove that in the ring Z of integers the ideal generated by prime integer is a maximal ideal.
5. Find the directional derivative of the function $xy^2 + yz^2 + zx^2$ along the tangent to the curve $x = t, y = t^2, z = t^3$ at the point $(1,1,1)$.
6. Find div $\bar{f}$ and curl $\bar{f}$ where $\bar{f} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$
7. If $\bar{F} = (x^2 + y^2)\bar{i} - 2xy\bar{j}$, evaluate $\oint_C \bar{F}.d\bar{r}$, where the curve C is the rectangle in the xy-plane bounded by $y = 0, y = b, x = 0, x = a$.
8. Evaluate $\oint_C (\cos x \sin y - xy)dx + \sin x \cos y\, dy$, by Green's theorem where C is the circle $x^2 + y^2 = 1$.

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 the set $Z[i] = \{a + ib \mid a, b \in Z, i^2 = -1\}$ of Gaussian integers is an integral domain w.r.t addition and multiplication of numbers.
10. If U_1 and U_2 are two ideals of a ring R , then prove that $U_1 \cup U_2$ is an ideal of R iff $U_1 \subset U_2$ or $U_2 \subset U_1$.
11. Prove that every quotient ring of a ring is a homomorphic image of the ring.
12. Prove that every maximal ideal of a commutative ring R with unity is a prime ideal.
13. If $\bar{a}$ is a constant vector, then prove that $\text{curl}\frac{\bar{a}\times\bar{r}}{r^3} = -\frac{\bar{a}}{r^3} + \frac{3\bar{r}}{r^5}(\bar{a}.\bar{r})$

SECTION-B

14. If f and g are two scalar point functions, then prove that $\text{div}(f\nabla g) = f\nabla^2 g + \nabla f.\nabla g$
15. If $\bar{F} = 4xz\bar{i} - y^2\bar{j} + yz\bar{k}$, evaluate $\int \bar{F}.\bar{N}dS$ where S is the surface of the cube bounded by $x = 0, x = a, y = 0, y = a, z = 0, z = a$.
16. If $\bar{F} = 2xz\bar{i} - x\bar{j} + y^2\bar{k}$ evaluate $\int_V \bar{F}.dV$ where V is the region bounded by the surfaces $x = 0, x = 2, y = 0, y = 6, z = x^2, z = 4$.
17. Verify Gauss's divergence theorem to evaluate $\int_S ((x^3 - yz)\bar{i} - 2x^2y\bar{j} + z\bar{k}).\bar{N}dS$ over the surface of a cube bounded by the co ordinate planes $x = y = z = a$.
18. State and prove Stokes theorem.

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III B.Sc Mathematics (for 2017-2020 batch, w.e.f 2017-18)
Paper VI, Syllabus for V 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 Quotientspace.

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-V
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 – Paper VI
Linear Algebra
Model Question Paper (for 2017-20 batch w. e. f 2017-2018)

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 → 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 ∈ 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 dimW ≤ 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 → V such that $T(\alpha_i) = \delta_i$ for $i = 1,2, \ldots, n$.

SECTION-B

14. Describe explicitly of the linear transformation $T : \mathbf{R}^2 \rightarrow \mathbf{R}^2$ 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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III B.Sc Mathematics (for 2017-20 batch w.e.f 2017-2018)
Paper VII , Syllabus for VI semester
ELECTIVE - VII- NUMERICAL ANALYSIS

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

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.

UNIT – II: (12 hours)(5 Marks-1, 10Marks-3)

Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized Newton Raphson method. Muller's Method

UNIT – III: (12 hours) Interpolation – I(5 Marks-1 10Marks-1)

Interpolation : Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of Differences Tables, Differences of a polynomial

UNIT – IV: (12 hours) Interpolation – II(5 Marks-2, 10 Marks - 3)

Newton's formulae for interpolation. Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula, Everett's Formula.

UNIT – V : (14 hours) Interpolation – III(5 Marks-2, 10 Marks - 3)

Interpolation with unevenly spaced points, Lagrange's formula, Error in Lagrange's formula, Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences Relation between divided differences and central differences, Newton's general interpolation Formula, Inverse interpolation.

PRESCRIBED TEXT BOOK:

Numerical Analysis by Dr. A Anjaneyulu, published by Deepti Publications.

Reference Books :

1. Numerical Analysis by S.S.Sastry, published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)
2. Numerical Analysis by G. Sankar Rao published by New Age International Publishers, New – Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

SEMESTER-VI
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	: 2 questions
Solution of Algebraic and Transcendental Equations	: 1 question
Interpolation – I	: 1 question
Interpolation – II	: 2 questions
Interpolation – 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:14,15) will be given from UNIT-IV.

SECTION-A

Solution of Algebraic and Transcendental Equations	: 3 questions
Interpolation-I	: 1 question
Interpolation-II (Newton's formulae for interpolation)	: 1 question

SECTION-B

Interpolation-II (Central Difference Interpolation formulae)	: 2 questions
Interpolation-III	: 3 questions

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III B.Sc. Mathematics – ELECTIVE Paper VII
(Numerical Analysis)
Model Question Paper (for 2017-20 batch w.e.f 2017-2018)

Time: 3Hrs Max Marks:75

PART-I

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

1. Given that $u = \frac{5xy^2}{z^3}$ Δx, Δy and Δz denote the errors in x, y and z respectively such that x=y=z=1 and $\Delta x = \Delta y = \Delta z = 1$. Find relative maximum error in u.
2. If 5/6 be represented approximately by 0.8333 find a) Relative error and b) percentage error.
3. Using Newton Raphson method establish the iterative formula $x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]$ to calculate the Square root on N.
4. Estimate the missing term in the following table.

x	0	1	2	3	4
y=f(x)	1	3	9	?	81

5. Prove that $\Delta = \frac{1}{2}\delta^2 + \delta[1 + \frac{\delta^2}{4}]^{\frac{1}{2}}$
6. Compute f(1.1) from the following data.

x	1	2	3	4	5
f(x)	7	12	29	64	123

7. If $f(x) = \frac{1}{x}$ then find f (a,b).where f(a,b) is the first divided difference.
8. Using Lagrange's formula to find a polynomial which passes through the points (3, 3), (2,12), (1,15),(-1, -21).

PART-II

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

SECTION – A

9. Solve the equation $x \log_{10} x - 1.2 = 0$, by using Regula-Falsi mehtod.
10. Find by the method of iteration a real roots of $2x - \log_x 10 = 7$.
11. Solve the equation $3x - \cos x - 1 = 0$, by using Newton Raphson method.
12. State and Prove that fundamental theorem of difference calculus on finite differences.
13. State and prove Newton's forward interpolation formula.

SECTION-B

14. State and prove Gauss backward interpolation formula.
15. Use Stirling's formula to find y_{28}, y_{20} = 49225, y_{25} = 48316, y_{30} = 47236, y_{35} = 45926, y_{40} = 44306.
16. Using the following data find f(x) as a polynomial in powers of (x-5) by extending the table to include arguments x=5 repeated as many times as may be necessary
f(0) = 4, f(2) = 26, f(3) = 58, f(4) = 112, f(7) = 466, f(9) = 922.
17. By Lagrange's interpolation formula find the value of y at x = 5. Given that

x	1	3	4	8	10
y	8	15	19	32	40

18. Using Newton's divided difference formula, prove that

$$f(x) = f(0) + x\Delta f(-1) + \frac{(x+1)x}{2!}\Delta^2 f(-1) + \frac{(x+1)x(x-1)}{3!}\Delta^3 f(-2) + \cdots$$

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Paper VIII-A, Syllabus for VI semester
CLUSTER ELECTIVE - VIII-A – ADVANCED NUMERICAL ANALYSIS

Unit – I (10 Hours)(5 Marks-1, 10 Marks-2)

Curve Fitting: Least – Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials.

UNIT- II : (12 hours) (5 Marks-2, 10 Marks-1)

Numerical Differentiation: Derivatives using Newton's forward difference formula, Newton's backward 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- III : (12 hours) (5 Marks-2, 10 Marks-2)

Numerical Integration: General quadrature formula on errors, Trapozoidal rule, Simpson's 1/3 – rule, Simpson's 3/8 – rule, and Weddle's rules, Euler – Maclaurin Formula of summation and quadrature, The Euler transformation.

UNIT – IV: (14 hours) (5 Marks-2, 10 Marks-2)

Solutions of simultaneous Linear Systems of Equations: Solution of linear systems – Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method ,Method of factorization, Solution of Tridiagonal Systems,. Iterative methods. Jacobi's method, Gauss-siedal method.

UNIT – V (12 Hours) (5 Marks-1, 10 Marks-3)

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:

Numerical Analysis by Dr. A Anjaneyulu, published by Deepti Publications.

Reference Books :

1. Numerical Analysis by S.S.Sastry, published by Prentice Hall India (Latest Edition).
2. Numerical Analysis by G. Sankar Rao, published by New Age International Publishers, New – Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt.Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

Suggested Activities:

Seminar/ Quiz/ Assignments

SEMESTER-VI
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Curve fitting	: 1 question
Numerical Differentiation	: 2 questions
Numerical Integration	: 2 questions
Solutions of Simultaneous Linear system of equations	: 2 questions
Numerical Solution of Ordinary Differential equation	: 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

Curve fitting	: 2 questions
Numerical Differentiation	: 1 question
Numerical Integration	: 2 questions

SECTION-B

Solutions of Simultaneous Linear system of equations	: 2 questions
Numerical Solution of Ordinary Differential equation	: 3 questions

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III B.Sc. Mathematics – Paper VIII A

CLUSTER ELECTIVE - VIII-A- ADVANCED NUMERICAL ANALYSIS
Model Question Paper (for 2017-20 batch w.e.f 2017-2018)

Time: 3Hrs Max Marks:75

PART-I

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

1. Find the least square line y = a+bx for the following data

x_r	-2	-1	0	1	2
y_r	1	2	3	3	4

2. 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

3. Find $f^1(1.5)$ from the following table

x	0	0.5	1	1.5	2
f(x)	0.3989	0.3521	0.2420	0.1295	0.0540

4. Find the value of $\int_1^5 \log_{10} x \, dx$ taking 8 subintervals correct to 4 decimal places, by Trapezoidal rule.
5. Evaluate $\int_0^1 \frac{1}{1+x} dx$, by Boole's rule.
6. Solve the system of equations 2x+2y+4z = 16, x+3y+2z = 13, 3x+y+3z = 14, by using Gauss Elimination method.
7. Solve the system of equations x+y+z = 1, x+2y+3z = 6, x+3y+4z = 6, by using matrix inverse method.
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. Determine the constants a and b by the method of least squares such the $y = a(e^{bx})$ fits thfollowing data

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

10. Fit a second degree Parabola to the following data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

11. 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

12. State and prove general quadrature formula and hence deduce Simpson's 1/3 rule.
13. Evaluate $I = \int_0^{\frac{\pi}{2}} \sin x \, dx$, using Euler-Maclaurin's formua.

SECTION-B

14. Solve the system of equations 5x+2y+z = 12, x+4y+2z = 15, x+2y+5z = 10, by using method of factorization.
15. Solve the system of equations 10x+y+z = 12, 2x+10y+z = 13, 2x+2y+10z = 14, by using Gauss- Seidel method.
16. Use Picard method to approximate y when x = 0.2 given that y = 1 when x = 0 and $\frac{dy}{dx} = x - y$.
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 VIII B , Syllabus for VI semester
CLUSTER ELECTIVE - VIII-B- SPECIAL FUNCTIONS

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

Hermite Polynomial: Hermite Differential Equations, Solution of Hermite Equation, Hermite's Polynomials, Generating function, other forms for Hermite Polynomial, To find first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

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

Laguerre Polynomials- I : Laguerre's Differential equation, Solution of Laguerre's equation, Laguerre Polynomials, Generating function, Other forms for the Laguerre Polynomials, To find first few Laguerre Polynomials, Orthogonal property of the Lguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation.

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

Legendre's equation : Definition, Solution of Legendre's equation, definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation (deviations 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 Equation, Recurrence formula, Rodrigues formula.

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

Bessel's equation : Definition, Solution of Bessel's General Differential Equations, General Solution of Bessel's Equation, Integration of Bessel's equation in series for n = 0, Definition of $J_n(x)$, Recurrence formulae for $J_n(x)$, Generating function for $J_n(x)$.

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

Beta and Gamma functions: 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, Other Transformation.

PRESCRIBED TEXT BOOK:

Special Functions by J.N.Sharma and Dr.R.K.Gupta.

SEMESTER-VI
BLUE PRINT

Time: 3Hrs. Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Hermite Polynomial	: 2 questions
Laguerre Polynomial	: 2 questions
Legendre's Equation	: 1 question
Bessel's Equation	: 1 question
Beta and Gamma functions	: 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

Hermite Polynomial	: 2 questions
Laguerre Polynomial	: 2 questions
Legendre's equation	: 1 question

SECTION-B

Legendre's equation	: 1 question
Bessel's equation	: 2 questions
Beta and Gamma functions	: 2 questions

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III B.Sc. Mathematics – Paper VIII B
ELECTIVE - VIII-B- SPECIAL FUNCTIONS
Model Question Paper (for 2017-20 batch w.e.f 2017-2018)

Time: 3Hrs Max Marks:75

PART-I

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

1. Prove that $H_n^{ll}(x) = 4n(n-1)H_{n-2}$
2. Prove that if m < n, $\frac{d^m}{dx^m}\{H_n(x)\} = \frac{2^m n!}{(n-m)!}H_{n-m}(x)$
3. Prove that $L_n^{l}(x) = -\sum_{r=0}^{n-1} L_r(x)$
4. Prove that $L_n^{\alpha}(x) = \frac{e^x x^{-\alpha}}{n!}.\frac{d^n}{dx^n}(e^{-x}.x^{n+\alpha})$
5. Prove that $(2n+1)xP_n = (n+1)P_{n+1} + nP_{n-1}$
6. Show that $J_{-\frac{1}{2}}(x) = \sqrt{\left(\frac{2}{\pi x}\right)}\cos x$
7. Compute $\Gamma\left(-\frac{1}{2}\right)$
8. Evaluate $\int_0^2 \frac{x^2 dx}{\sqrt{(2-x)}}$.

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 $\int_{-\infty}^{\infty} e^{-x^2} H_n(x)H_m(x)dx = \begin{cases} 0 & \text{if } m \neq n \\ 2^n\sqrt{\pi}\,n! & \text{if } m = n \end{cases}$
10. Show that $\sum_{r=0}^{n} \frac{H_k(x)H_k(z)}{2^k k!} = \frac{H_{n+1}(y)H_n(x) - H_{n+1}(x)H_n(y)}{2^{n+1}n!(y-x)}$
11. Prove that $L_n(x) = \frac{e^x}{n!}\frac{d^n}{dx^n}(x^n e^{-x})$
12. Prove that $L_{n-1}^{\alpha}(x) + L_n^{\alpha-1}(x) = L_n^{\alpha}(x)$.
13. Prove that $P_n(x) = \frac{1}{n!2^n}\frac{d^n}{dx^n}(x^2-1)^n$

SECTION-B

14. 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$m = n$
15. Prove that $J_n^{l}(x) = nJ_n(x) - xJ_{n+1}(x)$.
16. Prove that $\frac{d}{dx}[J_n^2 + J_{n+1}^2] = 2\left(\frac{n}{x} + J_n^2 - \frac{n+1}{x}J_{n+1}^2\right)$
17. Prove that $\beta(l,m) = \frac{\Gamma(l)\Gamma(m)}{\Gamma(l+m)}$.
18. Show that $2^n\Gamma\left(n+\frac{1}{2}\right) = 1.3.5\ldots(2n-1)\sqrt{\pi}$

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Foundation Course - 8
ANALYTICAL SKILLS

Syllabus, For all Degree Programmes.

Semester – IV (w.e.f. 2016-17)

(Total 30 Hrs)

UNIT – 1 : **Data Analysis (10 Questions)**
The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a passage is to be analyzed and the questions pertaining to the data are to be answered.

UNIT – 2 : **Sequence and Series (10 Questions)**
Analogies of numbers and alphabets completion of blank spaces following the pattern in A:b::C: d relationship odd thing out; Missing number in a sequence or a series.

UNIT – 3: **Arithmetic ability (10 Questions)**
Algebraic operations BODMAS, Fractions, Divisibility rules, LCM&GCD (HCF).

Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

UNIT - 4 : **Quantitative aptitude (10 Questions)**
Averages, Ration and proportion, Problems on ages, Time-distance – speed.

UNIT – 5 : **Business computations (10 Questions)**
Percentages, Profit &loss, Partnership, simple compound interest.

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
Analytical Skills
Model Question Paper (for 2018-21 batch w. e. f 2016-2017)

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

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

SECTION-A(Unit-I)

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

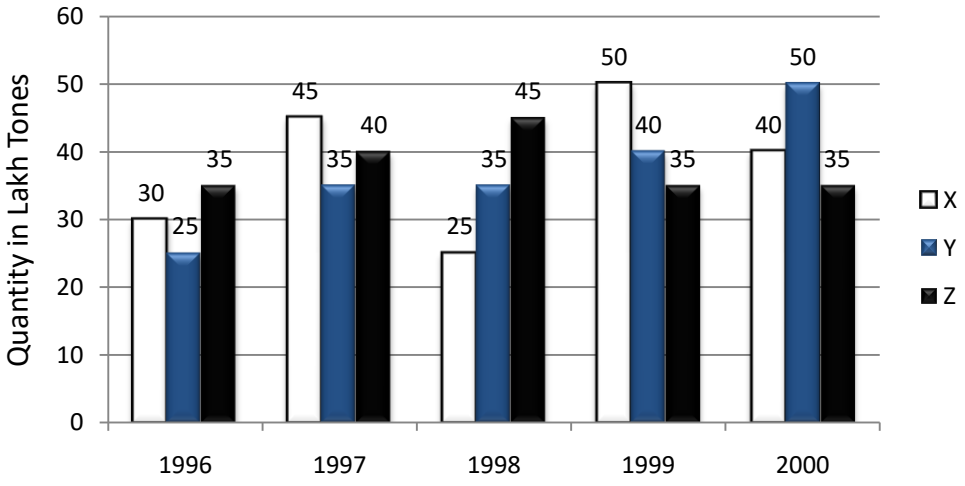
Classification of 100 students based on the marks obtained by them in Physics and Chemistry in an Examination

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

1. The number of students scoring less than 40% marks in aggregate is:
   (a) 13 (b) 19 (c) 20 (d) 27 (e) 34
2. 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
3. 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
4. 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%
5. 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

II. 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



6. 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
7. 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
8. 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%
9. 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
10. 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

SECTION-B(Unit-II, III, IV & V)

11. 1 : 1: : 25 : ?
   (a)26 (b) 125 (c) 240 (d) 625
12. 5 : 100, 4 : 64 : : 4 : 80, 3 : ?
   (a) 26 (b) 48 (c) 54 (d) 60
13. WONDER PES
   CLUSTER MTF
   MUSCLE ?
   (a) LRK (b) NSM (c) TBD (d) VDF
14. $\frac{2}{3}, \frac{4}{7}$, ?, $\frac{11}{21}, \frac{16}{31}$
   (a) $\frac{5}{9}$ (b) $\frac{6}{11}$ (c) $\frac{7}{13}$ (d) $\frac{9}{17}$
15. 2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11, ?
   (a) 9 (b) 10 (c) 11 (d) 12
16. 10, 18, 28, 40, 54 , 70, ?
   (a) 85 (b) 86 (c) 87 (d) 88
17. 2, 8, 16, 128, ?
   (a) 2042 (b) 2046 (c) 2048 (d) 2056
18. ab_d_aaba_na_badna_b
   (a) andaa (b) babda (c) badna (d) bdanb
19. abca_bcaab_ca_bbc_a
   (a) ccaa (b) bbaa (c) abac (d) abba
20. mnonopqopqrs_ _ _ _ _
   (a) mnopq (b) oqrst (c) pqrst (d) qrstu
21. $\frac{3\frac{1}{4}-\frac{4}{5} \text{ of } \frac{5}{6}}{4\frac{1}{3}\div\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)} =$
   (a) $\frac{1}{6}$ (b) $2\frac{7}{12}$ (c) $15\frac{1}{2}$ (d) $21\frac{1}{2}$
22. $\frac{(0.1667)(0.8333)(0.3333)}{(0.2222)(0.6667)(0.1250)}$ is approximately equal to :
   (a) 2 (b) 2.40 (c) 2.43 (d) 2.50
23. Find the H.C.F of $2^3 \times 3^2 \times 5 \times 7^4$, $2^2 \times 3^5 \times 5^2 \times 7^6$, $2^3 \times 5^3 \times 7^2$
   (a) 980 (b) 400 (c) 500 (d) 680
24. Which of the following is a pair of co-primes?
   (a) (16, 62) (b) (18, 25) (c) (21, 35) (d) (23, 92)

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

26. Find the angle between the hour hand and the minute hand of a clock when the time is 3.25.
(a) $55\frac{1}{2}^0$ (b) $47\frac{1}{2}^0$ (c)$35\frac{1}{2}^0$ (d) $25\frac{1}{2}^0$

27. The angle between the minute hand and hour hand of a clock when the time is 8 : 30 is :
(a) 80^0 (b) 75^0 (c) 60^0 (d) 105^0

28. 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

29. Looking at a portrait of a man, Harish said , "His mother is the wife of my father's son . Brothers and sisters I have none". At whose portrait was Harsh looking?
(a) His son (b) His cousin (c) His uncle
(d) His nephew (e) None of these

30. D the son-in-law of B, is the brother-in-law of A who is the brother of C. How is A related to B?
(a) Brother (b) Son (c) Father
(d) Data inadequate (e) None of these

31. The average weight of 10 oarsmen in a boat is increased by 1.8kg when one of the crew, who weighs 53kg is replaced by a new man. Find the weight of the new man.
(a) 55Kg (c) 71kg (c) 85kg (d) 95kg

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

33. The average score of a cricketer for ten matches is 38.9 runs. If the average for the first six matches is 42, then find the average for the last four matches.
(a) 33.25 (b) 33.5 (c) 34.25 (d) 35

34. A motorist travels to a place 150km away at an average speed of 50 km/hr and returns at 30 km / hr. His average speed for the whole journey in km / hr is :
(a) 35 (b) 37 (c) 37.5 (d) 40

35. 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

36. The ratio of the number of boys and girls in a college is 7 : 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?
(a) 8 : 9 (b) 17 : 18 (c) 21 : 22 (d) Cannot be determined

37. 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) Cannot be determined (e) None of these

38. In 10 years, A will be twice as old as B was 10 years ago. If A is now 9 years older than B, the present age of B is:
(a) 19 Years (b) 29 Years (c) 39 Years (d) 49 Years

39. 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

40. 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
41. The difference between a number and its two-fifth is 510. What is 10% of that number?
    (a) 12.75 (b) 85 (c) 204 (d) None of these
42. A scored 30% marks and failed by 15 marks. B scored 40% marks and obtained 35 marks more than those required to pass. The pass percentage is :
    (a) 33% (b) 38% (c) 43% (d) 46%
43. Alfred buys an old scooter for Rs.4700 and spends Rs.800 on its repairs. If he sells the scooter for Rs.5800, his gain percent is :
    (a) $4\frac{4}{7}\%$ (b) $5\frac{5}{11}\%$ (c) 10% (d) 12%
44. The cash difference between the selling prices of an article at a profit of 4% and 6% is Rs.3. The ratio of the two selling prices is :
    (a) 51 : 52 (b) 52 : 53 (c) 51 : 53 (d) 52 : 55
45. A,B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs.6500 for 6 months, B, Rs.8400 for 5 months and C, Rs.10,000 for 3 months. A wants to be the working member for which he was to receive 5 % of the profits. The profit earned was Rs.7400. Calculate the share of B in the profit.
    (a) Rs.1900 (b) Rs.2660 (c) Rs.2800 (d) Rs.2840
46. 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
47. 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
48. 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
49. A sum of money invested at compound interest amounts to Rs.800 in 3 years and to Rs. 840 in 4 years. The rate of interest per annum is :
    (a) $2\frac{1}{2}\%$ (b) 4% (c) 5 % (d) $6\frac{2}{3}\%$
50. Find the compound interest on Rs.15,625 for 9 months at 16% per annum compounded quarterly.
    (a) Rs.1851 (b) Rs.1941 (c) Rs.1951 (d) Rs.1961

Analytical Skills Question Bank

Unit-I

1. The following table gives the sales of batteries manufactured by a company over the years. Study the table and answer the questions that follow.

Number of different types of Batteries sold by a company over the years (Numbers in thousands)

Year	Types of Batteries					
	4AH	7 AH	32 AH	35 AH	55 AH	Total
1992	75	144	114	102	108	543
1993	90	126	102	84	126	528
1994	96	114	75	105	135	525
1995	105	90	150	90	75	510
1996	90	75	135	75	90	465
1997	105	60	165	45	120	495
1998	115	85	160	100	145	605

1. The total sales of all the seven years is the maximum for which battery?
   (a) 4AH (b) 7AH (c) 32AH (d) 35AH (e) 55AH
2. What is the difference in the number of 35AH batteries sold in 1993 and 1997?
   (a) 24000 (b) 28000 (c) 35000 (d) 39000 (e) 42000
3. The percentage of 4AH batteries sold to the total number of batteries sold was maximum in the year:
   (a) 1994 (b) 1995 (c) 1996 (d) 1997 (e) 1998
4. In the case of which battery there was a continuous decrease in sales from 1992 to 1997?
   (a) 4AH (b) 7AH (c) 32AH (d) 35AH (e) 55AH
5. What was the approximate percentage increase in the sales of 55AH batteries in 1998 compared to that in 1992?
   (a) 28% (b) 31% (c) 33% (d) 34% (e) 37%

2. Study the following table carefully and answer these questions:

Number of candidates appeared and qualified in a competitive examination from different states over the years

Year	1997		1998		1999		2000		2001	
State	App.	Qual.	App.	Qual.	App.	Qual.	App.	Qual.	App.	Qual.
M	5200	720	8500	980	7400	850	6800	775	9500	1125
N	7500	840	9200	1050	8450	920	9200	980	8800	1020
P	6400	780	8800	1020	7800	890	8750	1010	9750	1250
Q	8100	950	9500	1240	8700	980	9700	1200	8950	995
R	7800	870	7600	940	9800	1350	7600	945	7990	885

1. Combining the states P and Q together in 1998, what is the percentage of the candidates qualified to that of the candidates appeared?
   (a) 10.87% (b) 11.49% (c) 12.35% (d) 12.54% (e) 13.05%
2. The percentage of the total number of qualified candidates to the total number of appeared candidates among all the five states in 1999 is :
   (a) 11.49% (b) 11.84% (c) 12.21% (d) 12.57% (e) 12.73%
3. What is the percentage of candidates qualified from state N for all the years together, over the candidates appeared from state N during all the years together?
   (a) 12.36% (b) 12.16% (c) 11.47% (d) 11.15% (e) None of these.
4. What is the average of candidates who appeared from state Q during the given year?
   (a) 8700 (b) 8760 (c) 8810 (d) 8920 (e) 8990
5. In which of the given years the number of candidates appeared from State P has maximum percentage of qualified candidates?
   (a) 1997 (b) 1998 (c) 1999 (d) 2000 (e) 2001

3. The following table gives the percentage of marks obtained by seven students in six different subjects in an examination. Study the table and answer the questions based on it. The numbers in the brackets give the maximum marks in each subject.

Subjects(Max. Marks) / **Student**	Maths (150)	Chemistry (130)	Physics (120)	Geography (100)	History (60)	Computer Science (40)
Ayush	90	50	90	60	70	80
Aman	100	80	80	40	80	70
Sajal	90	60	70	70	90	70
Rohit	80	65	80	80	60	60
Muskan	80	65	85	95	50	90
Tanvi	70	75	65	85	40	60
Tarun	65	35	50	77	80	80

1. What was the aggregate of marks obtained by Sajal in all the six subjects?
   (a) 409 (b) 419 (c) 429 (d) 439 (e) 449
2. What is the overall percentage of Tarun?
   (a) 52.5% (b) 55% (c) 60% (d) 63% (e) 64.5%
3. What are the average marks obtained by all the seven students in Physics?
   (a) 77.26 (b) 89.14 (c) 91.37 (d) 96.11 (e) 103.21
4. The number of students who obtained 60% and above marks in all the subjects is:
   (a) 1 (b) 2 (c) 3 (d) None (e) None of these
5. In which subject is the overall percentage the best?
   (a) History (b) Maths (c) Physics (d) Chemistry (e) Geography

4. Study the following table and answer the questions based on it :

Number of candidates appeared, qualified and selected in a competitive examination from five states Delhi, H.P., U.P., Punjab and Haryana over the years 1997 to 2001

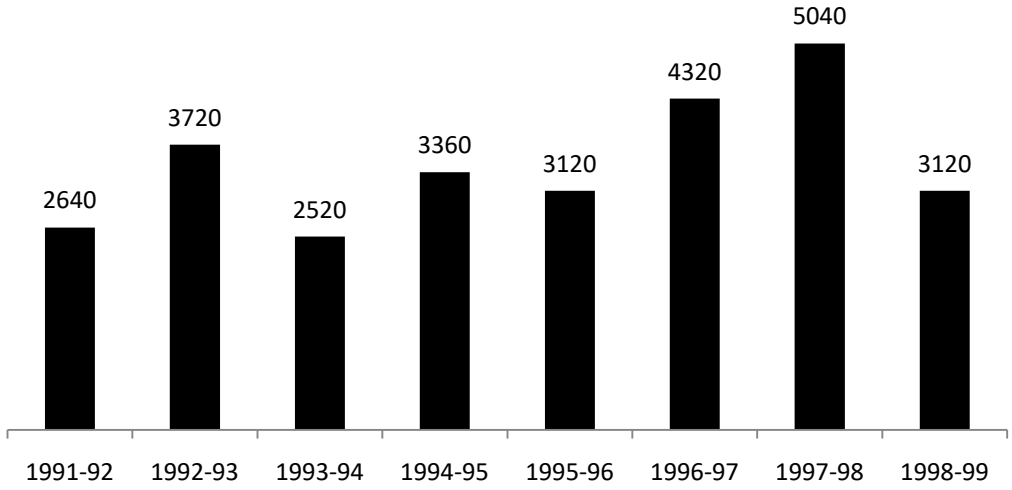
Year	Delhi			HP			UP			Punjab			Haryana		
	App	Qual	Sel	App	Qual	Sel	App	Qual	Sel	App	Qual	Sel	App	Qual	Sel
1997	8000	850	94	7800	810	82	7500	720	78	8200	680	85	6400	700	75
1998	4800	500	48	7500	800	65	5600	620	85	6800	600	70	7100	650	75
1999	7500	640	82	7400	560	70	4800	400	48	6500	525	65	5200	350	75
2000	9500	850	90	8800	920	86	7000	650	70	7800	720	84	6400	540	60
2001	9000	800	70	7200	850	75	8500	950	80	5700	485	60	4500	600	75

1. In the year 1997, which state had the lowest % of candidates selected over the candidates appeared?
   (a) Delhi (b) HP (c) UP (d) Punjab (e) Haryana
2. The percentage of candidates qualified from Punjab over those appeared from Punjab is highest in the year:
   (a) 1997 (b) 1998 (c) 1999 (d) 2000 (e) 2001
3. The percentage of candidates selected from UP over those qualified from UP is highest in the year :
   (a) 1997 (b) 1998 (c) 1999 (d) 2000 (e) 2001
4. The number of candidates selected from Haryana during the period under review is approximately what percent of the number selected from Delhi during the period?
   (a) 79.5% (b) 81% (c) 84.5% (d) 88.5% (e) 92.5%
5. For which state the average number of candidates selected over the years is the maximum?
   (a) Delhi (b) HP (c) UP (d) Punjab (e) Haryana

5. The bar graph given below shows the foreign exchange reserves of a country (in million US Dollars) from 1991-92 to 1998-99. Answer the questions based on this graph.

Foreign Exchange Reserves of a country

(in million US Dollars**)**



1. The foreign exchange reserves in 1997-98 was how many times that 1994-95?
   (a) 0.7 (b) 1.2 (c) 1.4 (d) 1.5 (e) 1.8
2. What was the percentage increase in the foreign exchange reserves in 1997-98 over 1993-94?
   (a) 100 (b) 150 (c) 200 (d) 620 (e) 2520
3. For which year, the percent increase of foreign exchange reserves over the previous year, is the highest?
   (a) 1992-93 (b) 1993-94 (c) 1994-95 (d) 1996-97 (e) 1997-98
4. The foreign exchange reserves in 1996-97 were approximately what percent of the average foreign exchange reserves over the period under review?
   (a) 95% (b) 110% (c) 115% (d) 125% (e) 140%
5. The ratio of the number of years, in which the foreign exchange reserves are above the average reserves, to those in which the reserves are below the average reserves is:
   (a) 2 : 6 (b) 3 : 4 (c) 3: 5 (d) 4 : 4 (e) 5 : 3

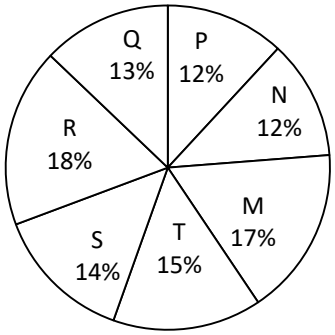
Important formulae for Pie-charts

- The sum of all the central angles is 360^0
- Central angle of the component $= \left(\frac{\text{Value of the component}}{\text{Total value}} \times 360\right)^0$

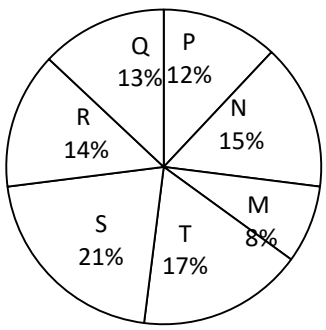
6. The following pie-charts show the distribution of students of graduate and post-graduate levels in seven different institutes – M,N,P,Q,R,S and T in a town.

Distribution of students at graduate and post-graduate levels in seven institutes – M,N,P,Q,R,S and T

Total number of students of Graduate level=27300



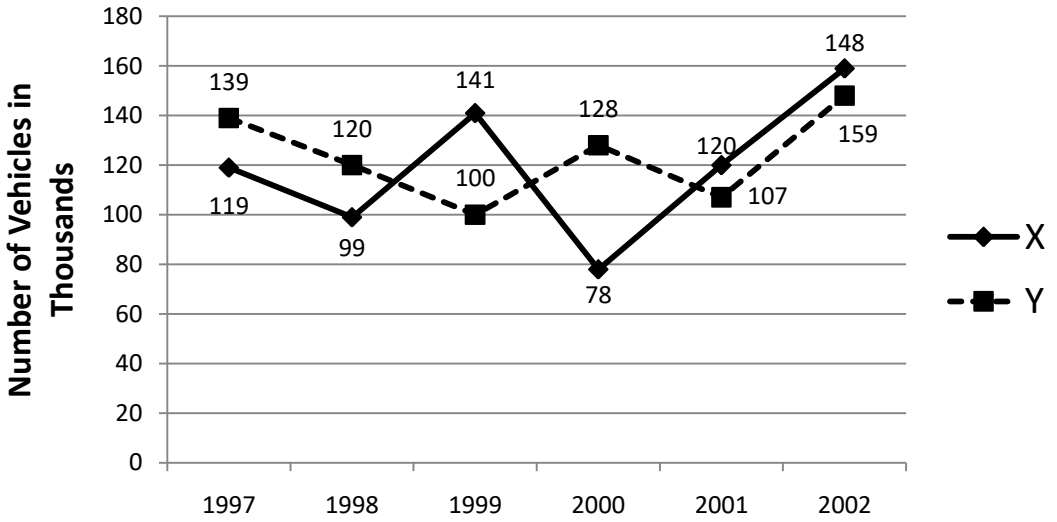
Total number of students of Post - Graduate level= 24700



1. How many students of institutes M and S are studying at graduate level?
   (a) 7516 (b) 8463 (c) 9127 (d) 9404
2. Total number of students studying at post-graduate level from institutes N and P is :
   (a) 5601 (b) 5944 (c) 6669 (d) 7004
3. What is the total number of graduate and Post-graduate level students in institute R?
   (a)8320 (b) 7916 (c) 9116 (d)8372
4. What is the ratio between the number of students studying at post-graduate and graduate levels respectively from institute S?
   (a) 14 : 19 (b) 19 : 21 (c) 17 : 21 (d) 19 : 14
5. What is the difference between the number of students studying at post graduate level from institutes S and the number of students studying at graduate level from institute Q?
   (a) 13 : 19 (b) 21 : 13 (c) 13 : 8 (d) 19 : 13

7. Study the following line-graph and answer the questions based on it.

Number of vehicles manufactured by Two Companies over the Years
(Number in Thousands)



1. What is the difference between the total productions of the two companies in the given years?
   (a) 19000 (b) 22000 (c) 26000 (d) 28000 (e) 29000
2. What is the difference between the numbers of vehicles manufactured by Company Y in 2000 and 2001?
   (a) 50000 (b) 42000 (c) 33000 (d) 21000 (e) 13000
3. What is the average number of vehicles manufactured by Company X over the given period?
   (a) 119333 (b) 113666 (c) 112778 (d) 111223 (e) None of these
4. In which of the following years, the difference between the productions of Companies X and Y was the maximum among the given years?
   (a) 1997 (b) 1998 (c) 1999 (d) 2000 (e) 2001
5. The production of company Y in 2000 was approximately what percent of the production of Company X in the same year?
   (a) 173 (b) 164 (c) 132 (d) 97 (e) 61

UNIT-II

Direction: In each of the following questions, there is a certain relationship between two given numbers on one side of : : and one number is given on another side of : : while another number is to be found from the given alternatives , having the same relationship with this number as the numbers of the given pair bear.

1. 21 : 3 : : 574 : ?
   (a) 23 (b) 82 (c) 97 (d)113
2. 121 : 12 : : 25 : ?
   (a) 1 (b) 2 (c) 6 (d) 7
3. 68 : 130 : : ? : 350
   (a) 210 (b) 216 (c) 222 (d) 240
4. 1 : 1: : 25 : ?
   (a) 26 (b) 125 (c) 240 (d) 625
5. 9 : 80 : : 100 : ?
   (a) 901 (b) 1009 (c) 9889 (d) 9999
6. 3265 : 4376 : : 4673 : ?
   (a) 2154 (b) 3562 (c) 5487 (d) 5784
7. 5 : 36 : : 6 : ?
   (a) 48 (b) 49 (c) 50 (d) 56
8. 5 : 100, 4 : 64 : : 4 : 80, 3 : ?
   (a) 26 (b) 48 (c) 54 (d) 60
9. 8 : 256
   (a) 7 : 343 (b) 9 : 243 (c) 10 : 500 (d) 5 : 75
10. 4718, 5617, 6312, 8314
    (a) 2715 (b) 3410 (c) 5412 (d) 6210
11. ABCD : NPRT : : FGHI : ?
    (a) KLMN (b) OQRT (c)RTUW (d) SUWY
12. AG : IO : : EK : ?
    (a) LR (b) MS (c) PV (d) SY
13. JLNP : OMKI : : SUWY : ?
    (a) FGHI (b) MLKJ (c) PLHD (d) XVTR
14. EIGHTY : GIEYTH : : OUTPUT : ?
    (a) TUOTUP (b) TUOUTP (c) UTOPTU (d) UOTUPT
15. COUNSEL : BITIRAK: : GUIDANCE : ?
    (a) EOHYZKBB (b) FOHYZJBB (c) FPHZZKAB (d) HOHYBJBA
16. CIRCLE is related to RICELC in the same way as SQUARE is related to ……
    (a) QSUERA (b) QUSERA (c) UQSAER (d) UQSERA
17. TRADE is related to UQBCF in the same way as PLATE is related to……
    (a) QKBSF (b) QKBUF (c) UQSAER (d) UQSERA
18. LLAMS : SMALL
    (a) SRENID : DINERS (b) CHART : TRACH (c) BARK : KRAB
    (d) TREE : EERT
19. WONDER PES
    CLUSTER MTF
    MUSCLE ?
    (a) LRK (b) NSM (c) TBD (d) VDF
20. BUCKET : ACTVBDJLDFSU : : BONUS : ?
    (a) ACMNMOTVRT (b) SUNOB (c) ACNPMOTVRT (d) ACMNMOTURT
21. 1, 9, 25, 49, ?, 121
    (a) 64 (b) 81 (c) 91 (d)100
22. 10, 18, 28, 40, 54 , 70, ?
    (a) 85 (b) 86 (c) 87 (d) 88

23. 325, 259, 204, 160, 127, 105, ?
    (a) 94 (b) 96 (c) 98 (d) 100
24. 5760, 960, ? , 48, 16, 8
    (a) 120 (b) 160 (c) 192 (d) 240
25. 1, 1, 4, 8, 9, 27, 16, ?
    (a) 32 (b) 64 (c) 81 (d) 256
26. 20, 20, 19, 16, 17, 13, 14, 11, ?, ?
    (a) 10, 10 (b) 10, 11 (c) 13, 14 (d) 13, 16
27. $\frac{2}{3}, \frac{4}{7}$, ?, $\frac{11}{21}, \frac{16}{31}$
    (a) $\frac{5}{9}$ (b) $\frac{6}{11}$ (c) $\frac{7}{13}$ (d) $\frac{9}{17}$
28. 2, 8, 16, 128, ?
    (a) 2042 (b) 2046 (c) 2048 (d) 2056
29. 2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11, ?
    (a) 9 (b) 10 (c) 11 (d) 12
30. 589654237, 89654237, 8965423, 965423, ?
    (a) 58965 (b) 65423 (c) 89654 (d) 96542
31. m_nm_n_an_a_ma_
    (a) aamnan (b) ammanm (c) aammnn (d) amammn
32. _nmmn_mmnn_mnnm_
    (a) nmmn (b) mnnm (c) nnmm (d) nmnm
33. ab_d_aaba_na_badna_b
    (a) andaa (b) babda (c) badna (d) bdanb
34. c_bbb_ _abbbb_abbb_
    (a) aabcb (b) abccb (c) abacb (d) bacbb
35. ac_cab_baca_aba_acac
    (a) aacb (b) acbc (c) babb (d) bcbb
36. abca_bcaab_ca_bbc_a
    (a) ccaa (b) bbaa (c) abac (d) abba
37. c_baa_aca_cacab_acac_bca
    (a) acbaa (b) bbcaa (c) bccab (d) cbaac
38. a_abbb_ccccd_ddccc_bb_ba
    (a)abcde (b) abdbc (c) abdcb (d) abcad
39. a_cacbc_baca_ _ b
    (a) baba (b) babc (c) abac (d) cacb
40. mnonopqopqrs_ _ _ _ _
    (a) mnopq (b) oqrst (c) pqrst (d) qrstu

Unit- III

Formulae:

1. **BODMAS rule:**
   B- Bracket, O – of, D – Division, M – Multiplication, A – Addition and
   S- Subtraction.
2. H.C.F = $\frac{\text{H.C.F.of Numerators}}{\text{L.C.M.of Denominators}}$ and L.C.M = $\frac{\text{L.C.M of Numerators}}{\text{H.C.F.of Denominators}}$
3. In 60 minutes, the minute hand gains 55 minutes on the other hand.
4. In every hour, both the hands coincide once.
5. The hands are in the same straight line when they are coincident or opposite to each other.
6. When the two hands are at right angles, they are 15 minute spaces apart.
7. When the hands are in opposite directions, they are 30 minute spaces apart.
8. Angle traced by hour hand in 12 hours = 360^0.
9. Angle traced by minute hand in 60 minutes = 360^0.
10. In a given period, the number of days more than the complete weeks are called *odd days*.
11. Every year divisible by 4 is a leap year, if it is not a century. A leap year has 366 days.
12. The year which is not a leap year is called an ordinary year. An ordinary year has 365 days.
13. 1 ordinary year = 365 days = 52 weeks + 1 day
14. 1 leap year = 366 days = 52 weeks + 2days

1. Simplify $b-\left[b-(a+b)-\left\{b-\left(b-\overline{a-b}\right)\right\}+2a\right]$
   (a) 4b (b) 4a (c) 3ab (d) 2b
2. Simplify $\frac{\frac{7}{2}\div\frac{5}{2}\times\frac{3}{2}}{\frac{7}{2}\div\frac{5}{2}\text{of}\frac{3}{2}}\div 5.25$
   (a) $\frac{8}{3}$ (b) $\frac{7}{3}$ (c) $\frac{3}{7}$ (d) $\frac{7}{6}$
3. If $\frac{2x}{1+\frac{1}{1+\frac{x}{1-x}}}=1$, then find the value of x
   (a) $\frac{7}{3}$ (b) $\frac{2}{3}$ (c) $\frac{5}{3}$ (d) $\frac{9}{3}$
4. Simplify $\left[3\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{1}{2}\left(2\frac{1}{2}-\overline{\frac{1}{4}-\frac{1}{6}}\right)\right\}\right]$
   (a) 98 (b) 45 (c)65 (d) 78
5. What mathematical operation should come at the place of ' ? ' in the equation:
   2 ? 6 -12 ÷4 + 2 = 11
   (a) + (b) – (c) × (d) ÷
6. $2-[2-\{2-2(2+2)\}]=?$
   (a) – 4 (b) 4 (c) 6 (d) None of these
7. Evaluate $\frac{8-[5-(-3+2)]\div 2}{|5-3|-|5-8|\div 3}$
   (a) 2 (b) 3 (c) 4 (d) 5
8. Find the value of ' x ' if $1\frac{2}{3}\div\frac{2}{7}\times\frac{x}{7}=1\frac{1}{4}\times\frac{2}{3}\div\frac{1}{6}$
   (a) 0.006 (b) 0.16 (c) 0.6 (d) 6
9. $\frac{4335}{4(?)24}\div 1\frac{7}{8}=\frac{289}{528}$ Find the missing digit in place of ' ? '
   (a) 1 (b) 2 (c) 8 (d) None of these

10. $\frac{3\frac{1}{4}-\frac{4}{5}\text{ of }\frac{5}{6}}{4\frac{1}{3}\div\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)}=$

(a) $\frac{1}{6}$ (b) $2\frac{7}{12}$ (c) $15\frac{1}{2}$ (d) $21\frac{1}{2}$

11. Solve 5172.49+378.352+ x = 9318.678

(a) 7637.683 (b) 7367.368 (c) 3767.836 (d) 7763.638

12. 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) $\frac{8}{9},\frac{9}{11},\frac{7}{9},\frac{2}{3},\frac{3}{5}$

13. Solve 0.014 x 0.014 = ?

(a) 0.000196 (b) 0.00196 (c) 19.6 (d) 196

14. 4.036 divided by 0.04 gives :

(a) 1.009 (b) 10.09 (c) 100.9 (d) None of these

15. $\frac{(0.1667)(0.8333)(0.3333)}{(0.2222)(0.6667)(0.1250)}$ is approximately equal to :

(a) 2 (b) 2.40 (c) 2.43 (d) 2.50

16. The value of $\left(\frac{0.051\times0.051\times0.051+0.041\times0.041\times0.041}{0.051\times0.051-0.051\times0.041+0.041\times0.041}\right)$ is

(a) 0.00092 (b) 0.0092 (c) 0.092 (d) 0.92

17. Find the H.C.F of 2^3 x 3^2 x 5 x 7^4, 2^2 x 3^5 x 5^2 x 7^6, 2^3 x 5^3 x 7^2

(a) 980 (b) 400 (c) 500 (d) 680

18. Find the H.C.F. of 513, 1134 and 1215.

(a) 27 (b) 45 (c) 69 (d) 88

19. Find the L.C.M. of 2^2 x 3^3 x 5 x 7^2, 2^3 x 3^2 x 5^2 x 7^4, 2 x 3x 5^3 x 7 x 11

(a) 2^3 x 3^3 x 5^3 x 7^4 x 11^2 (b) 2^3 x 3^3 x 5^3 x 7^3 x 11

(c) 2^3 x 3^3 x 5^3 x 7^4 x 11 (d) 2^3 x 3^3 x 5^2 x 7^4 x 11^2

20. Find the L.C.M of 16, 24, 36 and 54

(a) 433 (b) 432 (c) 324 (d) 234

21. Find the H.C.F and L.C.M of $\frac{2}{3},\frac{8}{9},\frac{16}{81}$, and $\frac{10}{27}$

(a) $\frac{4}{91}$ and $\frac{70}{4}$ (b) $\frac{9}{55}$ and $\frac{69}{5}$ (c) $\frac{2}{81}$ and $\frac{80}{3}$ (d) $\frac{5}{69}$ and $\frac{81}{7}$

22. 252 can be expressed as a product of primes as:

(a) 2 x 2x 3x 3 x 7 (b) 2 x 2 x 2 x 3x 7

(c) 3 x 3 x 3 x 3 x 7 (d) 2 x 3 x 3 x 3 x 7

23. Find H.C.F. of 36 and 84

(a) 4 (b) 6 (b) 12 (d) 18

24. The H.C.F. of 204, 1190 and 1445

(a) 17 (b) 18 (c) 19 (d) 21

25. Which of the following is a pair of co-primes?

(a) (16, 62) (b) (18, 25) (c) (21, 35) (d) (23, 92)

26. 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

27. The G.C.D. of 1.08, 0.36 and 0.9 is :

(a) 0.03 (b) 0.9 (c) 0.18 (d) 0.108

28. The L.C.M. of 3, 2.7 and 0.09 is :

(a) 2.7 (b) 0.27 (c) 0.027 (d) 27

29. The ratio of two numbers is 3 : 4 and their H.C.F is 4. Their L.C.M is :

(a) 12 (b) 16 (c) 24 (d) 48

30. Three numbers are in the ratio of 3 : 4 : 5 and their L.C.M is 2400. Their H.C.F. is

(a) 40 (b) 80 (c) 120 (d) 200

31. The greatest number that exactly divides 105, 1001 ad 2436 is :

(a) 3 (b) 7 (c) 11 (d) 21

32. What was the day of the week on 16th July, 1776?
    (a) Monday (b) Wednesday (c) Tuesday (d) Saturday
33. On What dates of March 2005 did Friday fall?
    (a) 4th , 12th , 18th and 25th (b) 4th , 11th 18th and 25th
    (c) 5th , 12th, 19th and 26th (d) 3rd , 10th , 17th and 24th
34. January 1, 2007 was Monday. What day of the week lies on Jan. 1, 2008?
    (a) Monday (b) Tuesday (c) Wednesday (d) Sunday
35. Which of the following is not a leap year?
    (a) 700 (b) 800 (c) 1200 (d) 2000
36. How many times do the hands of a clock coincide in a day?
    (a) 20 (b) 21 (c) 22 (d) 24
37. How many times are the hands of a clock at right angle in a day?
    (a) 22 (b) 24 (c) 44 (d) 48
38. 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
39. Pointing towards a person, a man said to a woman, “His mother is the only daughter of your father”. How is the woman related to that person?
    (a) Daughter (b) Sister (c) Mother (d) Wife
40. 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
41. 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

Unit-IV

Formulae

1. $\text{Average} = \left(\frac{\text{Sum of observations}}{\text{Number of observations}}\right)$
2. Suppose a man covers a certain distance at x kmph and an equal distance at y kmph. Then, the average speed during the whole journey is $\left(\frac{2xy}{x+y}\right)$kmph.
3. Speed = $\left(\frac{\text{Distance}}{\text{Time}}\right)$; Time = $\left(\frac{\text{Distance}}{\text{Speed}}\right)$; Distance = Speed $\times$ Time
4. x km per hour = $\left(x \times \frac{5}{18}\right)$ m per sec; x m / sec = $\left(x \times \frac{18}{5}\right)$ km/hr

1. Find the average of all prime numbers between 30 and 50
   (a) 40 (b) 41 (c) 55.5 (d) 39.8
2. The average of four consecutive even numbers is 27. Find the largest of these numbers.
   (a) 25 (b) 30 (c) 28 (d) 40
3. Find the average of first 40 natural numbers.
   (a) 20.5 (b) 60 (c) 55 (d) 35.4
4. The average of first five multiples of 3 is:
   (a) 3 (b) 9 (c) 12 (d) 15
5. The average weight of 10 oarsmen in a boat is increased by 1.8kg when one of the crew, who weighs 53kg is replaced by a new man. Find the weight of the new man.
   (a) 55Kg (b) 71kg (c) 85kg (d) 95kg
6. David obtained 76, 65, 82, 67 and 85 marks (out of 100) in English, Mathematics, Physics, Chemistry and Biology. What are his average marks?
   (a) 65 (b) 69 (c) 72 (d) 76 (e) None of these
7. The average of 2, 7, 6 and x is 5 and the average of 18, 1.6, x and y is 10. What is the value of y?
   (a) 30 (b) 20 (c) 40 (d) 35
8. A batsman makes a score of 87 runs in the 17^{th} innings and thus increases his average by 3. Find his average after 17^{th} inning.
   (a)38 (b) 40 (c) 45 (d) 39
9. The average of a non-zero number and its square is 5 times the number. The number is:
   (a) 9 (b) 17 (c) 29 (d) 295
10. The average of six numbers is x, and the average of three of these is y. If the average of the remaining three is z, then:
    (a) x = y + z (b) 2x = y + z (c) x = 2y+2z (d) None of these
11. The average weight of 45 students in a class is 52kg. Five of them whose average weight is 48kg leave the class and other 5 students whose average weight is 54kg join the class. What is the new average weight (in kg) of the class?
    (a) $52\frac{1}{3}$ (b) $52\frac{1}{2}$ (c) $52\frac{2}{3}$ (d) None of these
12. A motorist travels to a place 150km away at an average speed of 50 km/hr and returns at 30 km / hr. His average speed for the whole journey in km / hr is :
    (a) 35 (b) 37 (c) 37.5 (d) 40
13. If a : b = 5 : 9 and b : c = 4 : 7, find a : b : c
    (a) 22 : 63 : 65 (b) 20 : 36 : 63 (c) 15 : 30 : 58 (d) 20 : 60 : 63
14. Divide Rs. 1162 among A, B, C in the ratio 35 : 28 : 20
    (a) 940, 293, 802 (b) 904, 329, 208 (c) 490, 392, 280 (d) 409, 208, 923
15. If A : B = 5 : 7 and B : C = 6 : 11, then A : B : C is :
    (a) 55 : 77 : 66 (b) 30 : 42 : 77 (c) 35 : 49 : 42 (d) None of these
16. If 2A = 3B = 4C, then A : B : C is :
    (a) 2 : 3 : 4 (b) 4 : 3 : 2 (c) 6 : 4 : 3 (d) 20 : 15 : 2

17. If A : B = 3 : 4 and B : C = 8 : 9, then A : C is :
    (a) 1 : 3 (b) 3 : 2 (c) 2 : 3 (d) 1 : 2
18. If A : B : C = 2 : 3 : 4, then $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$ is equal to :
    (a) 4 : 9 : 16 (b) 8 : 9 : 12 (c) 8 : 9 : 16 (d) 8 : 9 : 24
19. If (a + b) : (b + c) : (c + a) = 6 : 7 : 8 and (a + b + c) = 14, then the value of c is:
    (a) 6 (b) 7 (c) 8 (d) 14
20. If Rs. 782 be divided into three parts, proportional to $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$, then the first part is :
    (a) Rs. 182 (b) Rs. 190 (c) Rs. 196 (d) Rs.204
21. If A : B = 8 : 15, B : C = 5 : 8 and C : D = 4 : 5, then A : D is equal to:
    (a) 2 : 7 (b) 4 : 15 (c) 8 ; 15 (d) 15 : 4
22. If A : B = $\frac{1}{2} : \frac{3}{8}$, 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
23. If 0.75 : x : : 5 : 8 , then x is equal to
    (a) 1.12 (b) 1.20 (c) 1.25 (d) 1.30
24. If 15% of x = 20% of y, then x : y is :
    (a) 3 : 4 (b) 4 : 3 (c) 17 : 16 (d) 16 : 17
25. The ratio of three numbers is 3 : 4 : 5 and the sum of their squares is 1250. The sum of the numbers is :
    (a) 30 (b) 50 (c) 60 (d) 90
26. The fourth proportional to 5, 8, 15 is :
    (a) 18 (b) 24 (c) 19 (d) 20 (e) 21
27. The third proportional to 0.36 and 0.48 is :
    (a) 0.64 (b) 0.1728 (c) 0.42 (d) 0.94
28. The ratio between two numbers is 3 : 4 and their L.C.M. is 180. The first number is
    (a) 60 (b) 45 (c) 20 (d) 15
29. The speeds of three cars are in the ratio 5 : 4 : 6. The ratio between the time taken by them to travel the same distance is :
    (a) 5 : 4 : 6 (b) 6 : 4 : 5 (C) 10 : 12 : 15 (d) 12 : 15 : 10
30. At present, the ratio between the ages of Arun and Deepak is 4 : 3. After 6 years, Arun's age will be 26 years. What is the age of Deepak at present?
    (a) 12 years (b) 15years (C) $19\frac{1}{2}$years (d) 21 years
31. 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
32. A is two years older than B who is twice as old as C. If the total of the ages of A, B and C be 27, then how old is B?
    (a) 7 (c) 8 (c) 9 (d) 10 (e) 11
33. 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 /hr
34. An athlete runs 200 meters race in 24 seconds. His speed is :
    (a) 20 km /hr (b) 24 km /hr (c) 28.5 km /hr (d) 30 km /hr
35. A car is running at a speed of 108 km /hr. What distance will it cover in 15 seconds?
    (a) 45 meters (b) 55 meters (c) 450 meters
    (d) Cannot be determined (e) None of these

36. A truck covers a distance of 550 meters in 1 minute whereas a bus covers a distance of 33kms in 45 minutes. The ratio of their speeds is :
    (a) 3 : 4 (b) 4 : 3 (c) 3 : 5 (d) 50 : 3
37. 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
38. A man on tour travels first 160 km at 64 km /hr and the next 160 km at 80 km /hr. The average speed for the first 320 km of the tour is :
    (a) 33.55 km /hr (b) 36 km /hr (c) 71.11 km /hr (d) 71 km /hr
39. A train when moves at an average speed of 40 km /hr, reaches its destination on time. When its average speed becomes 35 km /hr, then it reaches its destination 15 minutes late. Find the length of journey.
    (a) 30 km (b) 40 km (c) 70 km (d) 80 km
40. 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.

Unit-V

Important formulae:

1. To express x% as a fraction, we have $x\% = \frac{x}{100}$
2. To express $\frac{a}{b}$ as a percent : We have $\frac{a}{b} = \left(\frac{a}{b} \times 100\right)\%$
3. If the price of commodity increase by R%, then the reduction in consumption so as not to increase the expenditure is $\left[\frac{R}{100+R} \times 100\right]\%$
4. If the price of commodity decreases by R%, then the increase in consumption so as not to decrease the expenditure is $\left[\frac{R}{100-R} \times 100\right]\%$
5. If the population of a town be P now and suppose it increases at the rate of R% per annum, then :
   (i) Population after 'n' years = $P\left(1+\frac{R}{100}\right)^n$
   (ii) Population 'n' years ago = $\frac{P}{\left(1+\frac{R}{100}\right)^n}$
6. Let the present value of a machine is P. Suppose it depreciates at the rate of R% per annum. Then :
   (i) Value of the machine after 'n' years = $P\left(1-\frac{R}{100}\right)^n$
   (ii) Value of the machine 'n' years ago = $\frac{P}{\left(1-\frac{R}{100}\right)^n}$
7. If A is R% more than B, then B is less than A by $\left[\frac{R}{100+R} \times 100\right]\%$
8. If A is R% less than B, then B is more than A by $\left[\frac{R}{100-R} \times 100\right]\%$

Cost Price(CP): The price at which an article is purchased, is called its Cost price.
Selling Price(SP) : The price at which an article is sold, is called its Selling Price.
Profit or Gain: If SP is greater than CP., the seller is said to have a profit or gain.
Loss: IF SP is less than CP., the seller is said to have incurred a loss.

9. Gain = S.P. – C.P and Loss = C.P. –S.P
10. Gain % = $\left(\frac{\text{Gain} \times 100}{\text{C.P}}\right)$ and Loss % = $\left(\frac{\text{Loss} \times 100}{\text{C.P}}\right)$
11. S.P = $\left(\frac{100+\text{Gain }\%}{100}\right) \times \text{C.P}$ and S.P. = $\left(\frac{100-\text{Loss }\%}{100}\right) \times \text{C.P}$
12. C.P = $\left(\frac{100}{100+\text{Gain }\%}\right) \times \text{S.P}$ and C.P = $\left(\frac{100}{100-\text{Loss }\%}\right) \times \text{S.P}$

Principal: The money borrowed or lent out for a certain period is called the principal or the sum.
Interest : Extra money paid for using other's money is called interest.
Simple Interest (SI): If the interest on a sum borrowed for a certain period is reckoned uniformly, then it is called Simple Interest.
Principal = P , Rate R % per annum (p.a.) and Time = T years.

S.I = $\left(\frac{P \times R \times T}{100}\right)$; P = $\left(\frac{100 \times S.I}{R \times T}\right)$; R = $\left(\frac{100 \times S.I}{P \times T}\right)$; T = $\left(\frac{100 \times S.I}{P \times R}\right)$

1. Express 0.08% as a fraction (a) $\frac{8}{10}$ (b) $\frac{8}{100}$ (c) $\frac{8}{1000}$ (d) $\frac{8}{10000}$
2. The ratio 5 : 4 expressed as a percent equals :
   (a) 12.5% (b) 40% (c) 80% (d) 125%
3. What is 15% of Rs.34?
   (a) Rs. 3.40 (b) Rs.3.75 (c) Rs.4.50 (d) Rs.5.10
4. What percent of Rs.2650 is Rs.1987.50?
   (a) 60% (b) 75% (c) 80% (d) 90%
5. 65 % of ? = 20% of 422.50
   (a) 84.5 (b) 130 (c) 139.425 (d) 200

6. The difference between a number and its two-fifth is 510. What is 10% of that number?
   (a) 12.75 (b) 85 (c) 204 (d) None of these
7. In an election a candidate who gets 84% of the votes is elected by a majority of 476 votes. What is the total number of votes polled?
   (a) 672 (b) 700 (c) 749 (d) 848
8. A student secures 90%, 60% and 54% marks in test papers with 100,150 and 200 respectively as maximum marks. The percentage of his aggregate is :
   (a) 64 (b) 68 (c) 70 (d) None of these
9. If 20% of a = b, then b % of 20 is the same as :
   (a) 4% of a (b) 5% of a (c) 20% of a (d) None of these
10. Rohit spends 40% of his salary on food, 20% on house rent, 10% on entertainment and 10% on conveyance. If his savings at the end of a month are Rs.1500, then his monthly salary is :
    (a) Rs. 6000 (b) Rs.7500 (c) Rs.8000 (d) Rs.10,000
11. A's salary is 40% of B's salary which is 25% of C's salary. What percentage of C's salary is A's salary?
    (a) 5% (b) 10% (c) 15% (d) 20%
12. A person incurs 5% loss by selling a watch for Rs.1140. At what price should the watch be sold to earn 5% profit?
    (a) Rs. 1320 (b) Rs.1260 (c) Rs.1230 (d) Rs.1520
13. 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
14. A sells a bicycle to B at a profit of 20%. B sells it to C at a profit of 25%. If C pays Rs.225 for it, the cost price of the bicycle for A is :
    (a) Rs. 110 (b) Rs.120 (c) Rs.125 (d) Rs.150
15. The cash difference between the selling prices of an article at a profit of 4% and 6% is Rs.3. The ratio of the two selling prices is :
    (a) 51 : 52 (b) 52 : 53 (c) 51 : 53 (d) 52 : 55
16. 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
17. A, B, C subscribe Rs.50,000 for a business. A subscribe Rs.4000 more than B and and B Rs. 5000 more than C. Out of a total profit of Rs.35,000, A receives :
    (a) Rs.8400 (b) Rs.11,900 (c) Rs.13,600 (d) Rs.14,700
18. A, B,C hired a car for Rs.520 and used it for 7, 8 and 11 hours respectively. Hire charges paid by B were :
    (a) Rs.140 (b) Rs.160 (c) Rs.180 (d) Rs.220
19. 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
20. A,B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs.6500 for 6 months, B, Rs.8400 for 5 months and C, Rs.10,000 for 3 months. A wants to be the working member for which he was to receive 5 % of the profits. The profit earned was Rs.7400. Calculate the share of B in the profit.
    (a) Rs.1900 (b) Rs.2660 (c) Rs.2800 (d) Rs.2840

21. 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
22. A sum at simple interest at $13\frac{1}{2}\%$ per annum amounts to Rs.2502.50 after 4 years. Find the sum.
    (a) Rs.1365 (b) Rs.1589 (c) Rs.1526 (d) Rs.1625
23. 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
24. At what rate percent per annum will the simple interest on a sum of money be $\frac{2}{5}$ of the amount in 10 years?
    (a) 4% (b) $5\frac{2}{3}\%$ (c) 6% (d) $6\frac{2}{3}\%$
25. 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
26. A person invested in all Rs.2600 at 4%, 6% and 8% per annum simple interest. At the end of the year, he got the same interest in all the three cases. The money invested at 4% is :
    (a) Rs.200 (b) Rs.600 (c) Rs.800 (d) Rs.1200
27. 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
28. 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
29. In what time will Rs.1000 become Rs.1331 at 10% per annum compounded annually?
    (a) 6Years (b)8 years (c) 3 years (d) 2 years
30. A man serves Rs.200 at the end of each year and lends the money at 5% compound interest. How much will it become at the end of 3 years?
    (a) Rs.565.25 (b) Rs.635 (c) Rs.662.02 (d) Rs.666.50
31. Find the compound interest on Rs.15,625 for 9 months at 16% per annum compounded quarterly.
    (a) Rs.1851 (b) Rs.1941 (c) Rs.1951 (d) Rs.1961

KEY
Unit-I

Q.NO	1	2	3	4	5
1	C	D	D	B	D

Q.NO	1	2	3	4	5
2	C	B	D	E	E

Q.NO	1	2	3	4	5
3	E	C	B	B	B

Q.NO	1	2	3	4	5
4	D	D	B	D	A

Q.NO	1	2	3	4	5
5	D	A	A	D	C

Q.NO	1	2	3	4	5
6	B	C	D	D	D

Q.NO	1	2	3	4	5
7	C	D	A	D	B

UNIT-II

Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
1	B	2	C	3	C	4	D	5	D
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
6	D	7	B	8	B	9	C	10	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
11	D	12	B	13	D	14	A	15	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
16	D	17	A	18	A	19	D	20	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
21	B	22	D	23	A	24	C	25	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
26	A	27	C	28	C	29	B	30	D
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
31	C	32	C	33	A	34	B	35	A
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
36	C	37	A	38	C	39	B	40	C

UNIT-III

Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
1	B	2	C	3	B	4	D	5	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
6	D	7	D	8	D	9	B	10	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
11	C	12	C	13	A	14	C	15	D
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
16	C	17	A	18	A	19	C	20	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
21	C	22	A	23	C	24	A	25	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
26	C	27	C	28	D	29	D	30	A
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
31	B	32	C	33	B	34	B	35	A
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
36	C	37	C	38	B	39	C	40	D
Q.NO	Ans								
41	D								

UNIT-IV

Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
1	D	2	B	3	A	4	B	5	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
6	E	7	C	8	D	9	A	10	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
11	C	12	A	13	B	14	A	15	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
16	C	17	C	18	D	19	A	20	D
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
21	B	22	D	23	B	24	B	25	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
26	B	27	A	28	B	29	D	30	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
31	A	32	D	33	A	34	D	35	C
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
36	A	37	D	38	C	39	C	40	C

UNIT-V

Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
1	B	2	D	3	D	4	B	5	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
6	B	7	B	8	A	9	A	10	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
11	B	12	B	13	C	14	D	15	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
16	D	17	D	18	B	19	B	20	B
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
21	B	22	D	23	D	24	A	25	D
Q.NO	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
26	D	27	C	28	B	29	C	30	C
Q.NO	Ans								
31	C								