

MATHEMATICS

MODEL QUESTIONS

- **Answer all the questions. Each question has four choices (a), (b), (c), (d) of which only one is the correct answer. Choose the choice (a), (b), (c) or (d) corresponding to the correct answer.**

Unit – I

- Let U_n denote the integers relatively prime to n under multiplication mod n and U_n is a group. Then which of the following is not a cyclic group?
(a) U_{17} (b) U_{18} (c) U_{20} (d) U_{25}
- Let G be a group of order 30. Then which is true?
(a) G has a normal subgroup of order 15.
(b) A 3-Sylow subgroup of G is not normal in G .
(c) There are 4 non-isomorphic groups of order 30.
(d) None of these.
- Which of the following is not a ring with respect to ordinary operation of addition and multiplication?
(a) Z the set of all integers.
(b) N the set of all natural numbers.
(c) Q the set of rational numbers.
(d) R the set of real numbers.
- The eigen values of the matrix $\begin{bmatrix} 3 & 1 \\ 6 & 2 \end{bmatrix}$ are –
(a) $\{2, 3\}$ (b) $\{0, 1\}$ (c) $\{1, 2\}$ (d) $\{0, 5\}$
- Which of the following Diophantine equation has no solution?
(a) $56x + 72y = 40$ (c) $24x + 138y = 18$
(b) $18x + 3y = 48$ (d) $123x + 360y = 99$
- An orthonormal set in an inner product space X is a –
(a) Linearly independent set.
(b) Linearly dependent set.
(c) Linear span of X .
(d) None of the above.

Unit – II Analysis

- A metric space is compact if it is –
(a) Complete and totally bounded.
(b) Not complete and totally bounded.
(c) Complete and not totally bounded.
(d) Neither complete nor bounded.

8. Which of the following statement is true?
 (a) The Lebesgue integrable function over $(0, 1)$ forms a vector space.
 (b) Continuous function over $(0, 1)$ is Lebesgue integrable.
 (c) A function which is differentiable over $(0, 1)$ is Lebesgue integrable over $(0, 1)$.
 (d) A function which is Lebesgue integrable is always Reimann Integrable.
9. Let $\{a_n\}$ be the sequence of consecutive roots of the equation $\tan x = x$ for $x > 0$.
 The value of $\lim_{n \rightarrow \infty} (a_{n+1} - a_n)$ is -
 (a) 0 (c) 2π
 (b) $-\pi$ (d) π
10. The value of $1 - 1/7 + 1/9 - 1/15 + 1/17 - 1/23 + 1/25 - \dots$ is -
 (a) $\pi/8 (\sqrt{2} - 1)$ (c) $\pi/4 (\sqrt{2} - 1)$
 (b) $\pi/8 (\sqrt{2} + 1)$ (d) $\pi/4 (\sqrt{2} + 1)$
11. Which of the following statement is true?
 (a) $\sin x$ is not uniformly continuous on $[0, \infty)$
 (b) $\sin x^2$ is uniformly continuous on $[0, \infty)$
 (c) $\sin x^2$ is not uniformly continuous on $[0, \infty)$
 (d) none of (a), (b), (c) is true
12. every complete Metric Space is of -
 (a) Baire's first category.
 (b) Baire's second category.
 (c) Rare sets category.
 (d) None of these above.
13. If $1 \leq x \leq 64$, the greatest value of $(\log_2 x)^4 + 12(\log_2 x)^2 \log_2 (8/x)$ is -
 (a) 18 (c) 81
 (b) 58 (d) 85

Unit - III

Numerical Analysis & Differential equation

14. The inverse Laplace transform of $\frac{3p - 2}{P^2 + 1}$ is -
 (a) $2\cos t + 3\sin t$ (c) $\cos 2t + 3\sin 2t$
 (b) $2t^2 + 3\sin 2t$ (d) $3\cos t - 2\sin t$
15. The equation $xy'' - (x^2 - y^2)s - xyt + py - qx = 2(x^2 - y^2)$ is -
 (a) Parabolic (c) Elliptic
 (b) Hyperbolic (d) None of these.
16. Her mite equation is given by -
 (a) $(1 - x^2)y'' - 2xy' + p(p+1)y = 0$
 (b) $y'' - 2xy' + 2py = 0$
 (c) $y'' + p(x) dy/dx + Q(x)y = 0$
 (d) $x^2y'' + xy' + (x^2 - p^2)y = 0$
17. The Her mite interpolating polynomial with n nodes is of degree at most -
 (a) $2n$ (c) $2n + 1$
 (b) $2n - 1$ (d) $\frac{n}{2}$

18. If the rate of Convergence of Muller method for finding the roots of the equation $f(x) = 0$ is, then the value of p is –
- (a) 1.62 (c) 2
(b) 1.84 (d) 1

Unit – IV

19. The set of all feasible solutions to a LPP $Ax = b; x > 0$ is –
- (a) Neither open nor closed.
(b) Open convex set
(c) Closed convex set
(d) None of these
20. No. of basic variables in a balanced transportation problem with m origins and n destinations is –
- (a) $m + n$ (c) $m + n + 1$
(b) $m + n - 1$ (d) $m - n$
21. Solving a LPP by two phase method in Phase-I, if the optimal value of auxiliary objective function be not zero then the problem have –
- (a) No feasible solution
(b) Only one feasible solution
(c) Infinite number of F.S.
(d) None of these
22. A tree has two vertices of degree 2, one vertex of degree 3 and 3 vertices of degree four. Then the number of vertices of degree 1 is –
- (a) 9 (c) 8
(b) 6 (d) 11
23. The representation of the Boolean function $f(x, y) = x + xy$ in disjunctive normal form is –
- (a) $xy + xy'$ (c) $xy + x'y$
(b) $x'y' + x'y$ (d) $x'y' + xy'$
24. The graph contains 16 edges and all vertices of degree 2. Then the number of vertices of the graph is –
- (a) 16 (c) 12
(b) 8 (d) 24

Unit – V

25. The residue of $\frac{z^3}{z^2-1}$ at $z = \infty$
- (a) -1 (b) 1 (c) $\frac{1}{2}$ (d) 0
26. For the function $e^z/z \sin mz$, $z = 0$ is a –
- (a) Essential singularity (c) Removable singularity
(b) Pole (d) Simple zero
27. The function $f(z)$ is meromorphic function if –
- (a) $f(z) = \frac{e}{z}$ (c) $f(z) = \sin \frac{1}{z}$
(b) $f(z) = e^{1/z}$ (d) $f(z) = (z - i) \sin \frac{1}{z+2i}$

28. If x is a Hausdorff Space then a sequence of points of x converges to –
- (a) Infinitely many points of x .
 - (b) At most one point of x .
 - (c) At most two points of x .
 - (d) None of the above.
29. Every finite dimensional normed space is –
- (a) Transitive
 - (b) Reflexive
 - (c) Non-reflexive
 - (d) None of these
30. Every closed subspace of a normed space is –
- (a) Weakly complete
 - (b) Weakly sequentially compact
 - (c) Weakly closed
 - (d) None of the above

THE END