Sample Paper

3

AG-TMC-TS-TERM-1- 003

Time : 90 Minutes **Max Marks : 40**

General Instructions

1. *This question paper contains three sections – A, B and C. Each part is compulsory.*
2. *Section-A has **20** MCQs, attempt any **16** out of 20.*
3. *Section-B has **20** MCQs, attempt any **16** out of 20.*
4. *Section-C has **10** MCQs, attempt any **8** out of 10.*
5. *All questions carry equal marks.*
6. *There is no negative marking.*

SECTION-A

*In this section, attempt **any 16** questions out of questions 1-20. Each question is of 1 mark weightage.*

1. If A is a non-singular matrix of order 3, then $|\text{adj } A| = |A|^n$. Here the value of n is

(a) 2 (b) 4 (c) 6 (d) 8

2. The principal value of $\sin^{-1}\left(\sin\frac{5\pi}{3}\right)$ is

(a) $-\frac{5\pi}{3}$ (b) $\frac{5\pi}{3}$ (c) $-\frac{\pi}{3}$ (d) $\frac{4\pi}{3}$

3. If x is real number and $|x| < 3$, then

(a) $x \geq 3$ (b) $-3 < x < 3$ (c) $x \leq -3$ (d) $-3 \leq x \leq 3$

4. If $y = e^{x^x}$, then $\cdot \frac{dy}{dx} =$

(a) $y(1+\log_e x)$ (b) $yx^x(1+\log_e x)$ (c) $ye^x(1+\log_e x)$ (d) None of these

5. If x is real, then the minimum value of $x^2 - 8x + 17$ is

(a) – 1 (b) 0 (c) 1 (d) 2

6. If $\sin^{-1} x = y$, then

(a) $0 \leq y \leq \pi$ (b) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$ (c) $0 < y < \pi$ (d) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

7. x and b are real numbers. If $b > 0$ and $|x| > b$, then

(a) $x \in (-b, \infty)$ (b) $x \in (-\infty, b)$ (c) $x \in (-b, b)$ (d) $x \in (-\infty, -b) \cup (b, \infty)$

8. Given : $2x - y - 4z = 2$, $x - 2y - z = -4$, $x + y + \lambda z = 4$, then the value of λ such that the given system of equation has no solution, is

(a) 3 (b) 1 (c) 0 (d) – 3

9. The function $f(x) = \tan x - x$

(a) always increases (b) always decreases

(c) never increases (d) sometimes increases and sometimes decreases

10. If $y^x = e^{y-x}$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{1+\log y}{y \log y}$ (b) $\frac{(1+\log y)^2}{y \log y}$

(c) $\frac{1+\log y}{(\log y)^2}$ (d) $\frac{(1+\log y)^2}{\log y}$

11. $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to

(a) π (b) $-\frac{\pi}{3}$ (c) $\frac{\pi}{3}$ (d) $\frac{2\pi}{3}$

12. Which of the following function is decreasing on $\left(0, \frac{\pi}{2}\right)$?

(a) sin 2x (b) tan x (c) cos x (d) cos 3x

13. L.P.P is a process of finding

(a) Maximum value of objective function

(b) Minimum value of objective function

(c) Optimum value of objective function

(d) None of these

14. If A be a square matrix of order 3×3, then $|kA|$ is equal to

(a) $k|A|$ (b) $k^2|A|$ (c) $k^3|A|$ (d) $3k|A|$

15. The function $f(x) = 4\sin^3 x - 6\sin^2 x + 12\sin x + 100$ is strictly

(a) increasing in $\left(\pi, \frac{3\pi}{2}\right)$ (b) decreasing in $\left(\frac{\pi}{2}, \pi\right)$

(c) decreasing in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (d) decreasing in $\left[0, \frac{\pi}{2}\right]$

16. Which of the following is the principal value branch of $\text{cosec}^{-1}x$?

(a) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ (b) $(0, \pi) - \left[\frac{\pi}{2}\right]$

(c) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (d) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right] - \{0\}$

17. L.P.P. has constraints of

(a) one variables (b) two variables

(c) one or two variables (d) two or more variables

18. Which of the following is correct :

(a) Determinant is a square matrix

(b) Determinant is a number associated to a matrix

(c) Determinant is a number associated to a square matrix

(d) None of these

19. If $y = x(x-3)^2$ decreases for the values of x given by

(a) $1 < x < 3$ (b) $x < 0$ (c) $x > 0$ (d) $0 < x < \frac{3}{2}$

20. If x = f(t) and y = g(t), then $\frac{d^2y}{dx^2}$ is equal to

(a) $\frac{g''(t)}{f''(t)}$ (b) $\frac{g''(t)f'(t)-g'(t)f''(t)}{(f'(t))^3}$

(c) $\frac{g''(t)f'(t)-g'(t)f''(t)}{(f'(t))^2}$ (d) None of these

SECTION-B

*In this section, attempt **any 16** questions out of the questions 21-40. Each question is of 1 mark weightage.*

21. Corner points of feasible region of inequalities gives

(a) optional solution of L.P.P. (b) objective function

(c) constraints. (d) linear assumption

22. If $f: R \to R$ be definend by $f(x) = 2x + \cos x$, then f

(a) has a minimum at $x = \pi$ (b) has a maximum at $x = 0$

(c) is a decreasing function (d) is an increasing function

23. $\sin\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) 1

24. If area of triangle is 35 sq. units with vertices (2, – 6), (5, 4) and (k, 4). Then k is

(a) 12 (b) – 2 (c) – 12, – 2 (d) 12, – 2

25. If $y = \frac{f(x)}{\phi(x)}$ and $z = \frac{f'(x)}{\phi'(x)}$, then $\frac{f''}{f} - \frac{\phi''}{\phi} + \frac{2(y-z)}{f\phi}(\phi')^2 =$

(a) $\frac{d^2y}{dx^2}$ (b) $\frac{1}{y}\frac{d^2y}{dx^2}$

(c) $y\frac{d^2y}{dx^2}$ (d) None of these.

26. If $x^2 + y^2 = 1$, then

(a) $yy'' - (2y')^2 + 1 = 0$ (b) $yy'' - (y')^2 + 1 = 0$

(c) $yy'' - (y')^2 - 1 = 0$ (d) $yy'' - 2(y')^2 + 1 = 0$

27. The domain of the function $\cos^{-1}(2x-1)$ is

(a) [0, 1] (b) [–1, 1]

(c) (– 1, 1) (d) $[0, \pi]$

28. The interval on which the function $f(x) = 2x^3 + 9x^2 + 12x - 1$ is decreasing, is

(a) $[-1, \infty)$ (b) $[-2, -1]$

(c) $(-\infty, -2]$ (d) $[-1, 1]$

29. $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to

(a) π (b) $-\frac{\pi}{2}$ (c) 0 (d) $2\sqrt{3}$

30. If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and A_{ij} is the cofactors of a_{ij}, then value of Δ is given by

(a) $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$ (b) $a_{11}A_{11} + a_{12}A_{21} + a_{13}A_{31}$

(c) $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$ (d) $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$

31. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 - 2 = 0$ intersect at an angle of

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{6}$

32. If $f(x) = 2x$ and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be a discontinuous function?

(a) $f(x) + g(x)$ (b) $f(x) - g(x)$ (c) $f(x).g(x)$ (d) $\frac{g(x)}{f(x)}$

33. The slope of tangent to the curve $x = t^2 + 3t - 8$, $y = 2t^2 - 2t - 5$ at the point $(2, -1)$ is

(a) $\frac{22}{7}$ (b) $\frac{6}{7}$ (c) $\frac{-6}{7}$ (d) -6

34. Which of the following is the principal value branch of $\cos^{-1}x$?

(a) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (b) $(0, \pi)$

(c) $[0, \pi]$ (d) $(0, \pi) - \left\{\frac{\pi}{2}\right\}$

35. Let A be a non-singular square matrix of order 3×3. Then $|\text{Adj } A|$ is equal to :

(a) $|A|$ (b) $|A|^2$ (c) $|A|^3$ (d) $3|A|$

36. The tangent to the curve $y = e^{2x}$ at the point (0, 1) meets X-axis at

(a) (0, 1) (b) $\left(-\frac{1}{2}, 0\right)$

(c) (2, 0) (d) (0, 2)

37. Which of these terms is not used in a linear programming problem?

(a) Slack variables (b) Objective function

(c) Concave region (d) Feasible solution

38. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

(a) $[1, 2]$ (b) $[-1, 1]$

(c) $[0, 1]$ (d) None of these

39. The points at which the tangent to the curve $y = x^3 - 12x + 18$ are parallel to X-axis are

(a) $(2, -2), (-2, -34)$ (b) $(2, 34), (-2, 0)$

(c) $(0, 34), (-2, 0)$ (d) $(2, 2), (-2, 34)$

40. The optimal value of the objective function is attained at the points

(a) Given by intersection of inequations with axes only (b) Given by intersection of inequations with x- axis only

(c) Given by corner points of the feasible region (d) None of these

SECTION-C

*In this section, attempt **any 8** questions. Each question is of 1 mark weightage. Questions 46-50 are based on a case-study.*

41. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$, is

(a) 1 (b) –1 (c) 4 (d) no real values

42. If $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$, then AA^T is

(a) Zero matrix (b) I_2 (c) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (d) None of these

43. The order of the single matrix obtained from $\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix}\left\{\begin{bmatrix} -1 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 1 & 23 \\ 1 & 0 & 21 \end{bmatrix}\right\}$ is

(a) 2×3 (b) 2×2 (c) 3×2 (d) 3×3

44. If $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & -1 \\ 3 & 1 & 0 \end{bmatrix}$, then A is a

(a) symmetric matrix (b) skew-symmetric matrix

(c) diagonal matrix (d) none of these

45. If $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then A^{16} is equal to :

(a) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Case Study

The total cost of producing x T.V. sets per day is ₹ $(x^2 - 5x + 4)$ and the price per set at which they may be sold is ₹ $(2x - 5)$. Based on the above information answer the following.

46. The profit function is

(a) $48x + 4$ (b) $x^2 - 4$

(c) $x^2 - 3x + 54$ (d) $-x^2 + 7x - 9$

47. The profit function is

(a) one-one (b) one-many

(c) many-one (d) many-many

48. If 20 units T.V. produced in one day then profit is

(a) ₹ 400 (b) ₹ 35

(c) ₹ 396 (d) None of these

49. The number of T.V. produced in a day such that profit is zero are

(a) 2 units (b) ± 2 units

(c) 5 units (d) ± 5 units

50. The minimum number of T.V. produced in a day to make loss are

(a) 2 units (b) 1 unit

(c) 5 units (d) 10 units

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