Sample Paper

1

AG-TMC-TS-TERM-1- 001

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. Principal value of $\text{cosec}^{-1}\left(\frac{-2}{\sqrt{3}}\right)$ is equal to

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

2. The function $f(x) = \tan x - 4x$ is strictly decreasing on

(a) $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$ (b) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$ (c) $\left(-\frac{\pi}{3}, \frac{\pi}{2}\right)$ (d) $\left(\frac{\pi}{2}, \pi\right)$

3. If the matrices $A = [a_{ij}]$ and $B = [b_{ij}]$ and $C = [c_{ij}]$ are of the same order, say $m \times n$, satisfy Associative law, then

(a) $(A+B)+C = A+(B+C)$ (b) $A+B = B+C$

(c) $A+C = B+C$ (d) $A+B+C = A-B-C$

4. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 17 \\ 0 & -10 \end{bmatrix}$, then $|AB|$ is equal to :

(a) 80 (b) 100 (c) -110 (d) 92

5. Prinicpal value of $\tan^{-1}(\sqrt{3})$ is equal to

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{3}$

6. The angle of intersection of the curve $y^2 = x$ and $x^2 = y$ is

(a) $\tan^{-1}\left(\frac{3}{2}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$ (c) $\tan^{-1}\left(\frac{1}{2}\right)$ (d) $\tan^{-1}\left(\frac{1}{5}\right)$

7. Choose the incorrect statement.

(a) A matrix $A = [3]$ is a scalar matrix of order 1

(b) A matrix $B = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ is a scalar matrix of order 2

(c) A matrix $C = \begin{bmatrix} \sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$ of order 3 is not a scalar matrix

(d) None of the above

8. If A_{ij} denotes the cofactor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then value of $a_{11}A_{31} + a_{13}A_{32} + a_{13}A_{33}$ is

(a) 0 (b) 5 (c) 10 (d) -5

9. If $f(x) = \begin{cases} \dfrac{1-\sqrt{2}\sin x}{\pi - 4x}, & \text{if } x \neq \dfrac{\pi}{4} \\ a, & \text{if } x = \dfrac{\pi}{4} \end{cases}$ is continuous at $\dfrac{\pi}{4}$, then a is equal to

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

10. The constraints $-x_1 + x_2 \leq 1$, $-x_1 + 3x_2 \leq 9$, $x_1, x_2 \geq 0$ define on

(a) Bounded feasible space (b) Unbounded feasible space

(c) Both bounded and unbounded feasible space (d) None of these

11. $f(x) = \left(\dfrac{e^{2x} - 1}{e^{2x} + 1}\right)$ is

(a) an increasing function (b) a decreasing function

(c) an even function (d) None of these

12. If each of third order determinant of value Δ is multiplied by 4, then value of the new determinant is:

(a) Δ (b) 21Δ (c) 64Δ (d) 128Δ

13. Let $f(x) = \begin{cases} \dfrac{x^3 + x^2 - 16x + 20}{(x-2)^2}, & x \neq 2 \\ k, & x = 2 \end{cases}$

If f(x) is continuous for all x, then k =

(a) 3 (b) 5 (c) 7 (d) 9

14. Which of the following is correct statement?

(a) Diagonal matrix is also a scalar matrix (b) Identity matrix is a particular case of scalar matrix

(c) Scalar matrix is not a diagonal matrix (d) Null matrix cannot be a square matrix

15. If c_{ij} is the cofactor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then write the value of $a_{32}.c_{32}$

(a) 110 (b) 22 (c) -110 (d) -22

16. 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) $\frac{\pi}{6}$

17. In the interval [7, 9] the function f(x) = [x] is discontinuous at _____, where [x] denotes the greatest integer function

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

18. A vertex of bounded region of inequalities $x \geq 0, x + 2y \geq 0$ and $2x + y \leq 4$ is

(a) (1, 1) (b) (0, 1) (c) (3, 0) (d) (0, 1)

19. If the area of a triangle ABC, with vertices A(1, 3), B(0, 0) and C(k, 0) is 3 sq. units, then the value of k is

(a) 2 (b) 3 (c) 4 (d) 5

20. The range of the function $f(x) = 2\sqrt{x-2} + \sqrt{4-x}$ is

(a) $\left(\sqrt{2}, \sqrt{11}\right)$ (b) $\left[\sqrt{2}, -\sqrt{10}\right)$

(c) $\left(\sqrt{3}, \sqrt{10}\right]$ (d) $\left[\sqrt{2}, \sqrt{10}\right]$

SECTION-B

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

21. The line y = x + 1 is a tangent to the curve $y^2 = 4x$ at the point

(a) (1, 2) (b) (2, 1) (c) (1, –2) (d) (–1, 2)

22. Principal value of $\sec^{-1}(2)$ is equal to

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{3}$

23. The slope of the normal to the curve $y = 2x^2 + 3 \sin x$ at x = 0 is

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

24. If $A = [a_{ij}]$ is a matrix of order 4 × 5, then the diagonal elements of A are

(a) $a_{11}, a_{22}, a_{33}, a_{44}$ (b) $a_{55}, a_{44}, a_{33}, a_{22}, a_{11}$

(c) a_{11}, a_{22}, a_{33} (d) do not exist

25. $-\frac{2\pi}{5}$ is the principal value of

(a) $\cos^{-1}\left(\cos\frac{7\pi}{5}\right)$ (b) $\sin^{-1}\left(\sin\frac{7\pi}{5}\right)$

(c) $\sec^{-1}\left(\sec\frac{7\pi}{5}\right)$ (d) None of these

26. The maximum value of $\frac{\ln x}{x}$ in $(2, \infty)$ is

(a) 1 (b) e (c) 2/e (d) 1/e

27. If $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, the minor of the element a_{23} is

(a) 5 (b) 6 (c) 7 (d) 8

28. The inequalities $5x + 4y \geq 20$, $x \leq 6$, $y \leq 4$ form

(a) A square (b) A rhombus

(c) A triangle (d) A quadrilateral

29. If p, q, r are 3 real numbers satisfying the matrix equation, $[p\,q\,r]\begin{bmatrix} 3 & 4 & 1 \\ 3 & 2 & 3 \\ 2 & 0 & 2 \end{bmatrix} = [301]$ then $2p + q - r$ equals :

(a) -3 (b) -1 (c) 4 (d) 2

30. The matrix $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is invertible, if

(a) $\lambda \neq -17$ (b) $\lambda \neq -18$ (c) $\lambda \neq -19$ (d) $\lambda \neq -20$

31. At $x = \frac{5\pi}{6}$, $f(x) = 2\sin 3x + 3\cos 3x$ is

(a) maximum 1 (b) minimum

(c) zero (d) neither maximum nor minimum

32. The point of discontinuity of $f(x) = \tan\left(\frac{\pi x}{x+1}\right)$ other than $x = -1$ are :

(a) $x = 0$ (b) $x = \pi$

(c) $x = \frac{2m+1}{1-2m}$ (d) $x = \frac{2m-1}{2m+1}$

33. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|\text{adj } A|$ is

(a) a^{27} (b) a^9 (c) a^6 (d) a^2

34. If a matrix has 8 elements, then which of the following will not be a possible order of the matrix?

(a) 1×8 (b) 2×4

(c) 4×2 (d) 4×4

35. The maximum vale of $P = x + 3y$ such that $2x + y \leq 20$, $x + 2y \leq 20$, $x \geq 0, y \geq 0$ is

(a) 10 (b) 60 (c) 30 (d) None

36. The point on the curve $x^2 = 2y$ which is nearest to the point (0, 5) is

(a) $(2\sqrt{2}, 4)$ (b) $(2\sqrt{2}, 0)$ (c) $(0, 0)$ (d) $(2, 2)$

37. If a function f(x) is defined as $f(x)=\begin{cases}\frac{x}{\sqrt{x^2}}, & x\neq 0\\ 0, & x=0\end{cases}$ then :

(a) f(x) is continuous at x = 0 but not differentiable at x = 0 (b) f(x) is continuous as well as differentiable at x = 0

(c) f(x) is discontinuous at x = 0 (d) None of these.

38. Which of the following is not a vertex of the positive region bounded by the inqualities $2x + 3y \le 6$, $5x + 3y \le 15$ and $x, y \ge 0$

(a) (0, 2) (b) (0, 0) (c) (3, 0) (d) None

39. If $\begin{vmatrix} x & 2\\ 18 & x\end{vmatrix}=\begin{vmatrix} 6 & 2\\ 18 & 6\end{vmatrix}$, then x is equal to

(a) 6 (b) ± 6 (c) -6 (d) 6, 6.

40. If $f(x)=\begin{cases} xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)}, & x\neq 0\\ 0, & x=0\end{cases}$ then f(x) is

(a) discontinuous every where

(b) continuous as well as differentiable for all x

(c) continuous for all x but not differentiable at $x = 0$

(d) neither differentiable nor continuous at $x = 0$

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. Let $R = \{(3, 3) (5, 5), (9, 9), (12, 12), (5, 12), (3, 9), (3, 12), (3, 5)\}$ be a relation on the set $A = \{3, 5, 9, 12\}$. Then, R is:

(a) reflexive, symmetric but not transitive. (b) symmetric, transitive but not reflexive.

(c) an equivalence relation. (d) reflexive, transitive but not symmetric.

42. If R = {(x, y) : x is father of y}, then R is

(a) reflexive but not symmetric (b) symmetric and transitive

(c) neither reflexive nor symmetric nor transitive (d) Symmetric but not reflexive

43. The domain of the function $\cos^{-1}\log_2(x^2 + 5x + 8)$ is-

(a) [2, 3] (b) [–3, –2]

(c) [–2, 2] (d) [–3, 1]

44. If $\sin^{-1} x = \tan^{-1} y$, what is the value of $\frac{1}{x^2}-\frac{1}{y^2}$?

(a) 1 (b) –1

(c) 0 (d) 2

45. Domain of $\cos^{-1}[x]$ is

(a) [–1, 2] (b) [–1, 2)

(c) (–1, 2] (d) None of these

Case Study

For sport day activity the class teacher of class-XII measures the weight of students. The set of their weight is given as $W = \{40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50\}$.

Based on the above information answer the following:

46. If the relation R in set W define as $R = \{(x, y) : |x - y| = 1\}$ then R is

(a) Reflexive (b) Symmetric

(c) Transitive (d) Equivalence

47. If the relation R in set W define as $R = \{(x, y): x > y\}$ then R is

(a) Reflexive (b) Symmetric

(c) Transitive (d) Equivalence

48. The number of relations from W to W are

(a) 100 (b) 20

(c) 2^{100} (d) 2^{121}

49. The number of non-empty relation from W to W are

(a) 2^{10} (b) 2^{100}

(c) $2^{121} - 1$ (d) 99

50. If set A have m and set B have n elements then number of ordered pair $A \times B$ is

(a) $m + n$ (b) mn

(c) 2^{mn} (d) m^n

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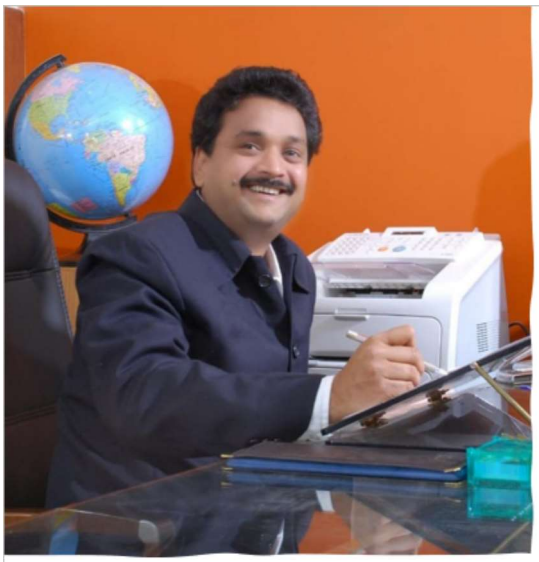

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