CLASS – XII (TEST PAPER-10)

MATHEMATICS (CODE-041) TERM - 1

Time : 90 MINUTESs Maximum Marks : 40

General Instructions:

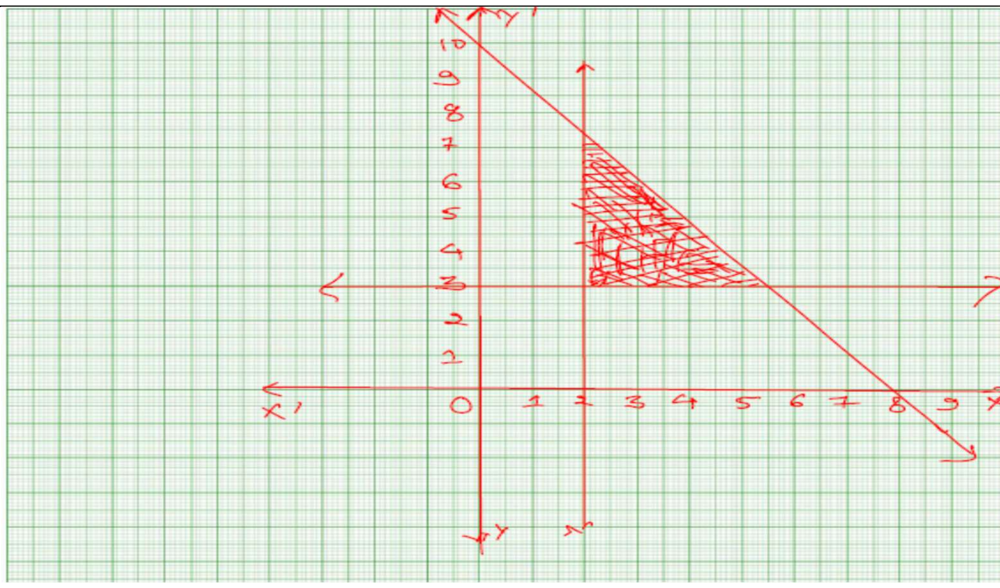
1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 20 MCQs, attempt any 16 out of 20.
3. Section - B has 20 MCQs, attempt any 16 out of 20
4. Section - C has 10 MCQs, attempt any 8 out of 10.
5. There is no negative marking.
6. All questions carry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

SECTION – A

In this section, attempt any 16 questions out of Questions 1 – 20. Each Question is of 1 mark weightage. In case more than desirable number of questions are attempted, ONLY first 16 will be considered for evaluation.

Q.1	$2\left\{\tan^{-1}(1)+\tan^{-1}(\frac{1}{2})+\tan^{-1}(\frac{1}{3})\right\}=$ (a) $\frac{\pi}{4}$ (b) π (c) $\tan^{-1}\frac{1}{2}$ (d) none
Q.2	$f(x)=\begin{cases} x, & x<1 \\ 2-x, & 1\le x\le 2 \\ -2+3x-x^2, & x>2 \end{cases}$. Which statement is true **(a)** f(x) is differentiable at x = 1 **(b)** f(x) is differentiable at x = 1 but f(x) is not differentiable at x = 2 **(c)** f(x) is differentiable at x = 2 but f(x) is not differentiable at x = 1 **(d)none**
Q.3	If $A=\begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$, and $A^{-1}=\begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, then x equals: a. 2 b. -1/2 c.1 d. ½
Q.4	If $A=\begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $B=\begin{bmatrix} -1 & 2 \\ -1 & 1 \end{bmatrix}$, then correct statement is (a) $AB=BA$ (b) $AA^T=A^2$ (c) $AB=B^2$ (d) None of these
Q.5	If the function be $f:R\to R$ defined by f(x) =tanx –x, then f(x) **(a) Increases (b) Decreases (c) Remains constant (d) Becomes zero**
Q.6	In the interval $\pi/2<x<\pi$, then the value of x = for which the matrix $\begin{pmatrix} 2\sin x & 3 \\ 1 & 2\sin x \end{pmatrix}$ is singular (a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{3}$ (c) $\frac{5\pi}{6}$ (d)none
Q.7	Let A = {1, 2, 3, 4} and let R= {(2, 2), (3, 3), (4, 4), (1, 2)} be a relation on A. Then R is (a)Reflexive (b) Symmetric(c) Transitive (d) None of these

Q.8	If $A=\begin{bmatrix}1&0&0&0\\2&3&0&0\\4&5&6&0\\7&8&9&10\end{bmatrix}$, then A is (a) An upper triangular matrix (b) A null matrix (c) A lower triangular matrix (d) None of these
Q.9	The tangent to the curve $y=ax^2+bx$ at $(2,-8)$ is parallel to x-axis. Then (a) $a=2, b=-2$ (b) $a=2, b=-4$ (c) $a=2\ b=-8$ (d) $a=4, b=-4$
Q.10	If $4\sin^{-1}x+\cos^{-1}x=\pi,$ then x is equal to (a) 0 (b) $\frac{1}{2}$ (c) $-\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{2}}$
Q.11	Let A = {1, 2, 3, 4} and let R= {(2, 2), (3, 3), (4, 4), (1, 2)} be a relation on A. Then R is (a)Reflexive (b) Symmetric(c) Transitive (d) None of these
Q.12	If $y=ae^{2x}+be^{-x}$, show that, $\frac{d^2y}{dx^2}-\frac{dy}{dx}=$ (a) 2 (b) 2y (c) -2y (d) NONE
Q.13	If A is a square matrix such that A(adj A) = 8I, where I denotes the identity matrix of the same order, then find the value of |A|= (a)8 (b)64(c)$\frac{1}{8}$(d) none
Q.14	The differential coefficient of x^6 with respect to x^3 is (a) $5x^2$ (b) $3x^3$ (c) $5x^5$ (d) $2x^3$
Q.15	If a matrix A of order 3 × 3 has determinant 4, then find the value of |A(5I)|= (a)100 (b)500(c)20(d) none
Q.16	The angle between curves $y^2=4x$ and $x^2+y^2=5$ at $(1,2)$ is (a) $\tan^{-1}(3)$ (b) $\tan^{-1}(2)$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$
Q.17	If $A=\begin{bmatrix}a&0&0\\0&b&0\\0&0&c\end{bmatrix}$, then $A^{-1}=$ (a) $\begin{bmatrix}a&0&0\\0&b&0\\0&0&c\end{bmatrix}$ (b) $\begin{bmatrix}-a&0&0\\0&-b&0\\0&0&-c\end{bmatrix}$ (c) $\begin{bmatrix}1/a&0&0\\0&1/b&0\\0&0&1/c\end{bmatrix}$ (d) None of these
Q.18	If $y=e^{x+e^{x+e^{x+\dots\infty}}}$, then $\frac{dy}{dx}=$ (a) $\frac{y}{1-y}$ (b) $\frac{1}{1-y}$ (c) $\frac{y}{1+y}$ (d) $\frac{y}{y-1}$

Q.19	 $(i)\ x \geq 2$ $(ii)\ y \geq 3$ $(iii)\ 5x + 4y \leq 40$ $(iv)\ 8x + 3y \leq 10$ $(v)\ x \leq 0$ (a) (i), (ii) & (iv) (b) (i), (ii) & (iii) (c) (iii) & (iv) (d) (ii), (iii) & (v)
Q.20	Local maximum value of the function $\frac{\log x}{x}$ is (a) e (b) 1 (c) $\frac{1}{e}$ (d) $2e$

SECTION – B

In this section, attempt any 16 questions out of the Questions 21 - 40. Each Question is of 1 mark weightage. **In case more than desirable number of questions are attempted, ONLY first 16 will be considered for evaluation.**

Q.21	Total number of bijective functions from set A and set B, where A = {1, 2, 3}, B = {a, b, c, d} **6 (b) 9 (c) 8 (d) 0**
Q.22	If $x^3 + 8xy + y^3 = 64$,then $\frac{dy}{dx} =$ (a) $-\frac{3x^2+8y}{8x+3y^2}$ (b) $\frac{3x^2+8y}{8x+3y^2}$ (c) $\frac{3x+8y^2}{8x^2+3y}$ (d) None of these
Q.23	By graphical method , the solution of linear programing problem maximize $z = 3x_1 + 5x_2$ subject to $3x_1 + 2x_2 \leq 18, , x_1 \leq 4, x_2 \leq 6 \& x_1, x_2 \geq 0$ is (a) $x_1 = 2, x_2 = 0, z = 6$ (b) $x_1 = 2, x_2 = 6, z = 36$ (c) $x_1 = 4, x_2 = 3, z = 27$ (d) $x_1 = 4, x_2 = 6, z = 42$
Q.24	$y = (\tan x)^{(\tan x)^{\tan x}}$, then at $x = \frac{\pi}{4}$, the value of $\frac{dy}{dx} =$ (a) 0 (b) 1 (c) 2 (d) None of these
Q.25	If A is a square matrix such that $A^T A = I$, write the value of |A|= (a) 1 (b) -1 (c) ± 1 (d) none
Q.26	$2x^3-6x+5$ is an increasing function if

	(a) 0<x<1 (b) -1<x<1 (c) x<-1 or x>1 (d) -1<x<-1/2
Q.27	$4\left[2\sin^{-1}\left(-\frac{1}{2}\right)+5\tan^{-1}(1)-3\cos^{-1}\frac{1}{2}\right]+\frac{1}{2}\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ (a) $\frac{\pi}{12}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{12}$ (d) None of these
Q.28	If $A=\begin{bmatrix}\lambda & 1\\ -1 & -\lambda\end{bmatrix}$, then for what value of λ, $A^2=O$ (a) 0 (b) ±1 (c) -1 (d) 1
Q.29	The least value of k for which the function x^2+kx+1 is an increasing function in the interval 1<x<2 is **(a) -4 (b) -3 (c) -1 (d) -2**
Q.30	For real numbers x and y, we write ${}^{x}R_{Y} \Leftrightarrow x - y+\sqrt{2}$ is an irrational number. Then, the relation R is: a. reflexive b. symmetric c. transitive d. None of these
Q.31	Examine the continuity and differentiability of the function f defined by $f(x) = \begin{cases} x\sin\frac{1}{x}, & x \neq 0 \\ 0, & x = 0\end{cases}$ at x = 0 **(a)** f(x) is discontinuous at x = 0 **(b)** f(x) is differentiable at x = 0 **(c))** f(x) is continuous but not differentiable at x = 0 (d) none
Q.32	If A and B are non-singular square matrix of same order, then $adj(AB)$ is equal to (a) $(adj\ A)(adj\ B)$ (b) $(adj\ B)(adj\ A)$ (c) $(adj\ B^{-1})(adj\ A^{-1})$ (d) $(adj\ A^{-1})(adj\ B^{-1})$
Q.33	A company manufactures two types of telephone sets A and B. The A type telephone set requires 2 hour and B type telephone requires 4 hour to make. The company has 800 work hour per day. 300 telephone can pack in a day. The selling prices of A and B type telephones are Rs. 300 and 400 respectively. For maximum profit company produces x telephones of A type and y telephones of B type. Then except $x \geq 0$ and $y \geq 0$, linear constraints are (a) $x + 2y \leq 400$; $x + y \leq 300$; Max $z = 300x + 400y$ (b) $2x + y \leq 400$; $x + y \geq 300$;Max $z = 400x + 300y$ (c) $2x + y \geq 400$; $x + y \geq 300$; Max $z = 300x + 400y$ (d) $x + 2y \leq 400$; $x + y \geq 300$ Max $z = 300x + 400y$
Q.34	A closed cylinder has volume $2156\,cm^3$. Total surface area is minimum What will be the radius of its base (a) 7 (b) $\frac{7}{\sqrt{3}}$ (c) 14 (d) NONE
Q.35	If $AX = B, B=\begin{bmatrix}9\\52\\0\end{bmatrix}$ and $A^{-1}=\begin{bmatrix}3 & \frac{-1}{2} & \frac{-1}{2}\\ -4 & \frac{3}{4} & \frac{5}{4}\\ 2 & -\frac{1}{4} & -\frac{3}{4}\end{bmatrix}$, then X is equal to

	(a) $\begin{bmatrix}1\\3\\5\end{bmatrix}$ (b) $\begin{bmatrix}-\frac{1}{2}\\-\frac{1}{2}\\2\end{bmatrix}$ (c) $\begin{bmatrix}-4\\2\\3\end{bmatrix}$ (d) $\begin{bmatrix}3\\\frac{3}{4}\\\frac{-3}{4}\end{bmatrix}$
Q.36	$\cos^{-1}\left(\sin\left(-\frac{19\pi}{3}\right)\right)$ (a) $\frac{5\pi}{6}$ (b) $-\frac{\pi}{6}$ (c) $\frac{\pi}{6}$ (d) NONE
Q.37	If for a square matrix $A, AA^{-1}=I$, then A is (a) Orthogonal matrix (b) Symmetric matrix (c) Diagonal matrix (d) Invertible matrix
Q.38	Let f:R→R be a function defined by $f(x)=x+\sqrt{x^2}$ then f is : a. injective b. surjective c. bijective d. None of these
Q.39	The slope of the tangent to the curve $x=3t^2+1, y=t^3-1$ at $x=1$ is (a) 0 (b) $\frac{1}{2}$ (c) ∞ (d) -2
Q.40	For any 2×2 matrix A, if $A(adj.A)=\begin{bmatrix}10&0\\0&10\end{bmatrix}$, then $\|A\|=$ (a) 0 (b) 10 (c) 20 (d) 100

SECTION – C

In this section, attempt any 8 questions. Each question is of 1-mark weightage. Questions 41-50 are based on a Case-Study. In case more than desirable number of questions are attempted, ONLY first 8 will be considered for evaluation.

Q.41	The equation of the tangent to the curve $(1+x^2)y=2-x$, where it crosses the x-axis, is (a) $x+5y=2$ (b) $x-5y=2$ (c) $5x-y=2$ (d) $5x+y-2=0$
Q.42	Maximize z = 3x + 2y, subject to x + y ≥ 1, y – 5x ≤ 0, x – y ≥ –1, x + y ≤ 6, x ≤ 3 and x, y ≥ 0 (a) x = 3 (b) y = 3 (c) z = 15 (d) All the above
Q.43	The sum of two non-zero numbers is 4. The minimum value of the sum of their reciprocals is (a) $\frac{3}{4}$ (b) $\frac{6}{5}$ (c) 1 (d) None of these
Q.44	Let $f(x)=[x]$ and $g(x)=\|x\|$. The value of $(gof)\left(\frac{-19}{3}\right)-(fog)\left(\frac{-19}{3}\right)$ (a) 1 (b) -1 (c) 0 (d) none
Q.45	If $A=\begin{vmatrix}-1&2&4\\3&1&0\\-2&4&2\end{vmatrix}$ and $B=\begin{vmatrix}-2&4&2\\6&2&0\\-2&4&8\end{vmatrix}$, then B is given by (a) $B=4A$ (b) $B=-4A$ (c) $B=-A$ (d) $B=6A$
	CASE STUDY Peter's father wants to construct a rectangular garden using a rock wall on one side of the garden and wire fencing for the other three sides as shown in figure.

	 He has 100 ft of wire fencing. Based on the above information, answer the following questions.
Q.46	To construct a garden using 100 ft of fencing, we need to maximise its (a) volume (b) area (c) perimeter (d) length of the side
Q.47	If x denote the length of side of garden perpendicular to rock wall and y denote the length of side parallel to rock wall, then find the relation representing total amount of fencing wall. (a) $x + 2y = 100$ (b) $x + 2y = 50$ (c) $y + 2x = 100$ (d) $y + 2x = 50$
Q.48	Area of the garden as a function of x i.e., A(x) can be represented as (a) $100 + 2x^2$ (b) $x - 2x^2$ (c) $100x - 2x^2$ (d) $100 - x^2$
Q.49	Maximum value of A(x) occurs at x equals (a) 25 ft (b) 30 ft (c) 26 ft (d) 31 ft
Q.50	Maximum area of garden will be (a) 1200 sq. ft (b) 1000 sq. ft (c) 1250 sq. ft (d) 1500 sq. ft
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