KENDRIYA VIDYALAYA SANGATHAN HYDERABAD REGION
SECOND PRE-BOARD EXAMINATION 2025-26
SET-2

Class: XII | **Time Allowed: 03 Hours**
Subject: Mathematics (041) | **Maximum Marks: 80**
Roll No..................

General Instructions: -

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains **38** questions. **All** questions are **compulsory**.
2. This Question paper is divided into five Sections - **A, B, C, D and E**.
3. In **Section A**, Questions no. **1 to 18** are multiple choice questions (MCQs) with only one correct option and Questions no. **19 and 20** are Assertion-Reason based questions of 1 mark each.
4. In **Section B**, Questions no. **21 to 25** are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In **Section C**, Questions no. **26 to 31** are Short Answer (SA)-type questions, carrying 3 marks each.
6. In **Section D**, Questions no. **32 to 35** are Long Answer (LA)-type questions, carrying 5 marks each.
7. In **Section E**, Questions no. **36 to 38** are Case study-based questions, carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.
9. Use of calculator is **not** allowed

SECTION-A
(This section comprises of multiple-choice questions (MCQs) of 1 mark each.)

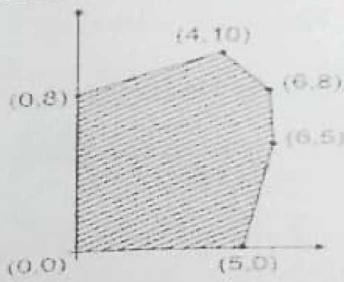
Q.No.	Questions	Marks
1.	If $\cos(\sin^{-1}\frac{2}{5} + \cos^{-1}x) = 0$ then x =____ (A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) 0 (D) 1	1
2.	The co-factor of a_{32} in the determinant $\begin{vmatrix} 2 & 0 & 1 \\ 5 & 3 & 8 \\ 3 & 2 & 1 \end{vmatrix}$ is: (A) 11 (B) -10 (C) 12 (D) -11	1
3.	If $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ then A^{2025} is equal to (A) $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 2025 & 0 \\ 0 & 0 \end{bmatrix}$	1
4.	For what value of $'x'$, the matrix $\begin{pmatrix} 3-x & 2 \\ x+1 & 3 \end{pmatrix}$ is singular. (A) 2 (B) $\frac{7}{2}$ (C) $\frac{7}{5}$ (D) $\frac{9}{5}$	1

5.	For the square matrix A of order 2 x 2 if $A.adj(A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$ then the value of $\lvert adjA \rvert$ is (A) 8 (B) 4 (C) $4\sqrt{2}$ (D) 64	1
6.	The value of 'k' so that f(x) = $\begin{cases} \frac{x-4}{\lvert x-4 \rvert} + k & , if\ x < 4 \\ 2k, & if\ x \geq 4 \end{cases}$ is continuous at x = 4 is (A) -1 (B) 0 (C) 1 (D) $\frac{-1}{3}$	1
7.	The point on the curve $y^2 = 8x$ for which the change of abscissa is same as the change of ordinate (A) (4, 2) (B) (2, 4) (C) (2, 2) (D) (4, 4)	1
8.	If $x.e^y = 1$ then $\frac{dy}{dx}$ at $x = -1$ is (A) -1 (B) 1 (C) e (D) e^{-1}	1
9.	If $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as the sum of a symmetric and skew symmetric matrix, then the symmetric matrix is (A) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ -3 & 1 & 2 \end{bmatrix}$ (C) $\begin{bmatrix} 4 & 2 & -4 \\ 2 & 6 & 4 \\ -4 & 4 & 4 \end{bmatrix}$ (D) $\begin{bmatrix} 4 & 4 & -8 \\ 4 & 6 & 8 \\ -8 & 8 & 4 \end{bmatrix}$	1
10.	If $(3\hat{i} + \lambda\hat{j} + 6\hat{k}) \times (2\hat{i} - 2\hat{j} + \mu\hat{k}) = \vec{0}$, then $\lambda + \mu =$ (A) 0 (B) 2 (C) 3 (D) 1	1
11.	If a line makes an angle α, β, γ with x, y, z axis, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$ (A) 1 (B) 2 (C) 0 (D) 3	1
12.	$\int \frac{COS2x - COS2\theta}{COSx - COS\theta} dx$ is equal to (A) $2(sinx + sin\theta) + C$ (B) $2(sinx - xcos\theta) + C$ (C) $2(sinx + xcos\theta) + C$ (D) $2(sinx - sin\theta) + C$	1
13.	$\int_0^{\frac{\pi}{2}} \cos x e^{sinx} dx$ *is equal to* (A) e (B) $e - 1$ (C) $e + 1$ (D) $-e$	1
14.	The solution of the differential equation $\frac{dy}{dx} = 3x^2 + 2$ is: (A) $y = x^3 - 2x + C$ (B) $y = x^3 + 2x^2 + C$ (C) $y = 3x^3 + 2x + C$ (D) None of the above	1

15. The corner points of the feasible region determined by the system of linear inequalities are $(0,0), (4,0), (2,4)$ and $(0,5)$. If the maximum value of $Z = ax + by$, where a, b > 0 occurs at both $(2,4)$ *and* $(4,0)$, then **1**

(A) a= 2b (B) 2a =b (C) a = b (D) 3a = b

16. The feasible solution for a LPP is shown in given figure. Let $Z = 3x - 4y$ be the objective function. Minimum of Z occurs at **1**



(A) (0, 0) (B) (0, 8) (C) (5, 0) (D) (4, 10)

17. What is the vector in the direction of the vector $\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$ that has magnitude 9 **1**

(A) $\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$ (B) $\frac{\hat{\imath}-2\hat{\jmath}+2\hat{k}}{3}$

(C) $9(\hat{\imath} - 2\hat{\jmath} + 2\hat{k})$ (D) $3(\hat{\imath} - 2\hat{\jmath} + 2\hat{k})$

18. Given two independent events A and B such that P(A) = 0.3, P(B) = 0.6 then P(A'∩B') is **1**

(A) 0.36 (B) 0.18 (C) 0.38 (D) 0.28

ASSERTION-REASON BASED QUESTIONS

Direction: Question numbers 19 and 20 are Assertion-Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

19. ***Assertion (A):*** The principal value of $tan^{-1}(-\sqrt{3})$ *is* $-\frac{\pi}{3}$ **1**

Reason (R): Domain of $\tan^{-1}(x)$ is $\mathbf{R} - \{-1, 1\}$.

20. ***Assertion (A):*** $\vec{a} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ *and* $\vec{b} = \hat{\imath} + \hat{\jmath} - \hat{k}$ are perpendicular vectors **1**

Reason (R): Two vectors are perpendicular iff $\vec{a} X \vec{b} = \vec{0}$

SECTION B

(This section comprises of 5 very short answer (VSA) type questions of 2 marks each.)

21. Evaluate $\int e^x \frac{x}{(1+x)^2} dx$ **2**

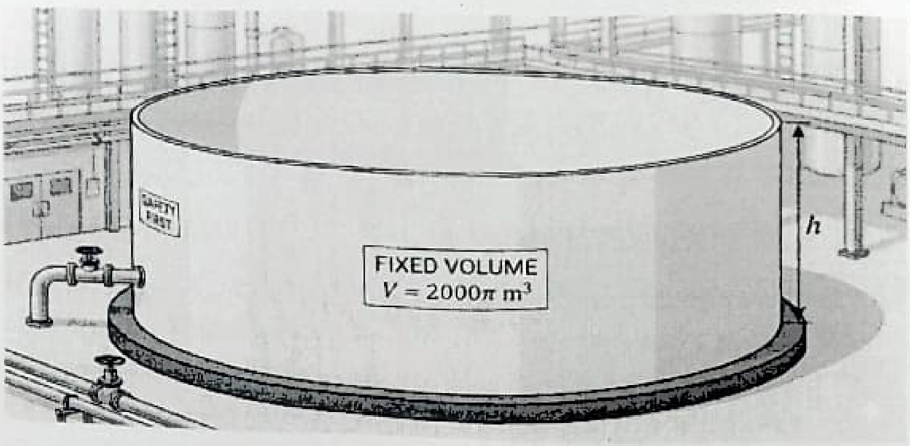
OR

Evaluate $\int_1^3 [|x-1| + |x-2|]\, dx$

22.	Find the value (s) of k so that the following function is continuous at $x = 0$, $f(x) = \begin{cases} \frac{1-\cos kx}{x\sin x}, & if\ x \neq 0 \\ \frac{1}{2}, & if\ x = 0 \end{cases}$	2
23.	Find the derivative of $\tan^{-1} x$ with respect to $\log x$, where $x \in (1, \infty)$	2
24.	Find the domain of the function $f(x) = \sin^{-1}(x^2 - 4)$. **OR** Find the value of k if $\sin^{-1}[k\tan(2\cos^{-1}\frac{\sqrt{3}}{2})] = \frac{\pi}{3}$	2
25.	Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors such that $\lvert\vec{a}\rvert = 1$, $\lvert\vec{b}\rvert = 2$ and $\lvert\vec{c}\rvert = 3$, projection of $\vec{b}$ on $\vec{a}$ is same as projection of $\vec{c}$ on $\vec{a}$ and $\vec{b}$ is perpendicular to $\vec{c}$ then find the value of $\lvert 3\vec{a} - 2\vec{b} + 2\vec{c}\rvert$	2
	SECTION C **(This section comprises of 6 short answer (SA) type questions of 3 marks each.)**	
26.	Solve the following linear programming problem graphically. Minimize: $z = x + 2y$ subject to constraints: $x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$, $x, y \geq 0$	3
27.	If $x = ae^t(\sin t + \cos t)$ and $y = ae^t(\sin t - \cos t)$ then prove that $\frac{dy}{dx} = \frac{x+y}{x-y}$ **OR** If $y = x^x$ then prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$	3
28.	Find the interval for which the function $f(x) = x^4 - \frac{4x^3}{3}$ is strictly increasing.	3
29.	Find the values of p so that the lines $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are at right angles. **OR** Find the point of intersection of the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$	3
30.	A coach is training 3 players. He observes that Player A can hit a target 4 times in 5 attempts, Player B can hit 3 times in 4 attempts, and Player C can hit 2 times in 3 attempts. Based on this information, find the probability that: (i) All of them hit the target, (ii) Exactly two of them hit the target.	3

31.	Find the area of the region bounded by the line $y = 3x + 2$, the $x - axis$ and the ordinates $x = -1$ and $x = 1$ **OR** Sketch the graph of $y = \|x + 3\|$ and find the area of the region enclosed by the curve, $x - axis$, between $x = -6$ and $x = 0$, using integration.	3
	SECTION - D **(This section comprises of 4 long answer (LA) type questions of 5 marks each)**	
32.	A furniture workshop produces three types of furniture – chairs, tables and beds each day. On a particular day the total number of furniture pieces produced is 45. It was also found that production of beds exceeds that of chairs by 8, while the total production of beds and chairs together is twice the production of tables. Determine the units produced of each type of furniture, using matrix method.	5
33.	Two vertices of parallelogram ABCD are given as $A(-1, 2, 1)$ and $B(1, -2, 5)$. If the equation of the line passing through C and D is $\frac{x-4}{1} = \frac{y+7}{-2} = \frac{z-8}{2}$, then find the distance between the parallel sides AB and CD. Hence, find the area of parallelogram ABCD.	5
34.	Find the general solution of the following differential equation $2xe^{\frac{y}{x}}dy + \left(x - 2ye^{\frac{y}{x}}\right) dx = 0$ **OR** Solve the differential equation $(x^2 - 1)\frac{dy}{dx} + 2xy = \frac{2}{x^2-1}$	5
35.	Evaluate $\int_0^{\frac{3}{2}} \|x \cos \pi x\| \, dx$ **OR** Evaluate $\int \left(\sqrt{\cot x} + \sqrt{\tan x}\right) dx$	5
	SECTION- E **(This section comprises of 3 case-study/passage-based questions of 4 marks each with subparts. The first two case study questions have three subparts (I), (II), (III) of marks 1, 1, 2 respectively. The third case study question has two subparts of 2 marks each)**	
36.	An industrial chemical plant needs to construct an open-top cylindrical storage tank to hold a specific chemical. The safety protocols require the tank to have a fixed capacity (volume) of $2000\pi \ m^3$. Due to the corrosive nature of the chemical, the material used for the base is different from the material used for the curved walls: The cost of the material for the base is ₹ 100 per m^2. The cost of the material for the curved walls is ₹ 50 per m^2.	4

P.T.O.



Let r be the radius of the base and h be the height of the tank in meters.

Based on the above information, answer the following questions:

(i) Establish a relationship between r and h using the given volume. Then, express the total Cost function 'C' entirely in terms of the radius r. **(1)**

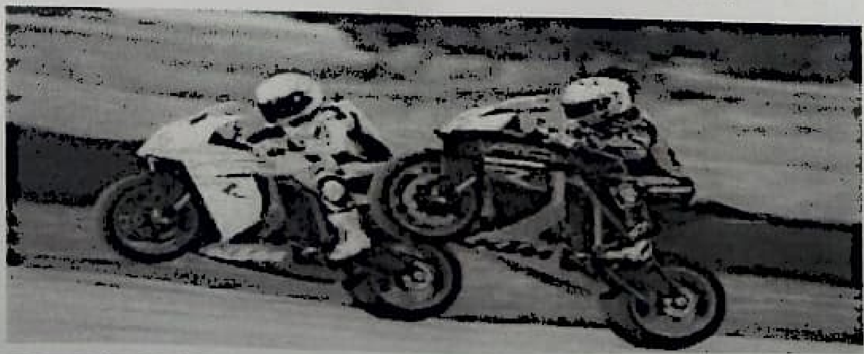
(ii) Find the derivative $\frac{dC}{dr}$ and determine the critical point (value of r) for the cost function. **(1)**

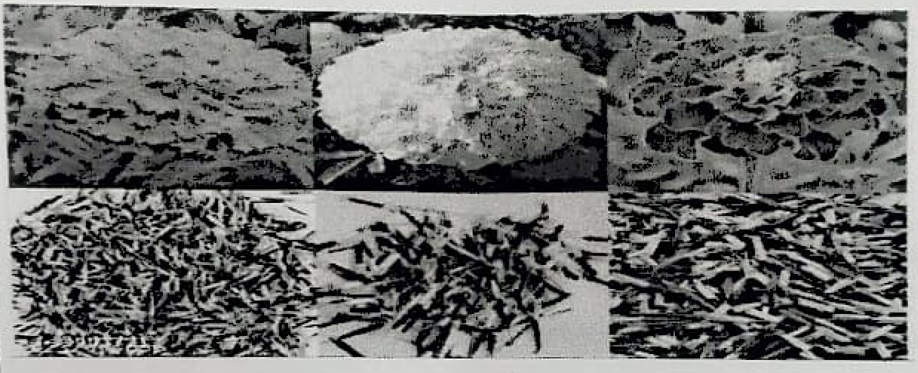
(iii) a) Use the Second Derivative Test to verify that the cost is minimum at the critical point found in part (ii). Also, calculate the height h at this minimum cost. **(2)**

OR

(iii) b) Calculate the minimum construction cost (in ₹) for the tank. **(2)**

37. An organisation conducted bike race under 2 different categories boys and girls. In all there were 250 participants. Among all of them finally three from category 1 and two from category 2 were selected for the final race. Ravi forms two sets B and G with these participants for his college projects. Let B = $\{b_1, b_2, b_3\}$, G = $\{g_1, g_2\}$ where B represents for the set of boys selected and G the set of all girls who were selected for the final race. Ravi decides to explore these two sets for various types of relations and functions. 4



	Based on the above information, answer the following questions (i) Ravi wishes to form all the relations possible from B to G. How many such relations are possible. **(1)** (ii) Write the smallest equivalence relation on G. **(1)** (iii) Ravi defines a relation from B to B as $R_1 = \{(b_1, b_2), (b_2, b_1)\}$. Write the minimum ordered pairs to be added to R_1 so that it becomes (A) reflexive but not symmetric (B) reflexive and symmetric but not transitive. **(2)** **OR** If the track of the final race (for biker b_1) follows the curve $x^2 = 4y$, (where $0 \leq x \leq 20\sqrt{2}$ and $0 \leq y \leq 200$), then state whether the track represents one-one and onto or not justify.	
38.	A shopkeeper sells three types of flower seeds A1, A2 and A3. They are sold in the form of a mixture, where the proportions of these seeds are 2: 2: 1 respectively. The germination rates of the three type of seeds are 45%, 60% and 35% respectively.  Based on the above information answer the following questions: (i) Calculate the probability that a randomly chosen seed will germinate. **(2)** (ii) Calculate the probability that the seed is of type A2, given that a randomly chosen seed germinates. **(2)**	4