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SAMPLE PAPER PRE BOARD EXAMINATION (2025-26)

Class: XII

SUBJECT MATHEMATICS

Max. Time – 3 Hrs. **Max. Marks - 80**

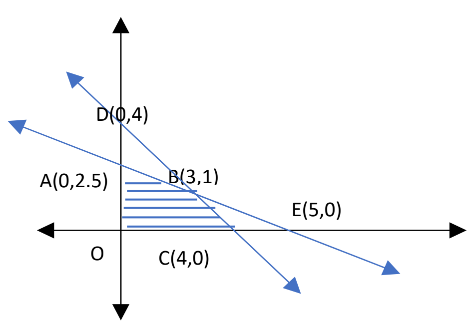
General Instructions:

1. This question paper contains 38 questions divided into three sections- A, B, C & D
2. All questions are compulsory.
3. Section - A contains **20 very short answer type (VSA)** of 1 mark each.
4. Section - B contains **5 short answer type (SA-I)** questions of 2 marks each.
5. Section - C contains **6 short answer type (SA-II)** of 3 marks each.
6. Section -D contains **4 long answer type questions (LA)** of 5 marks each.
7. Section -E contains **3 case-based questions (CBQ)** of 4 marks each.

SECTION-A

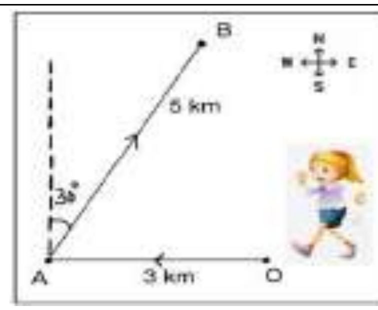
1	If $A = [a_{ij}]$ is an identity matrix, then which of the following is true? A. $a_{ij} = \begin{cases} 0, \text{if } i = j \\ 1, \text{if } i \neq j \end{cases}$ B. $a_{ij} = 1, \forall i, j$ C. $a_{ij} = 0, \forall i, j$ D. $a_{ij} = \begin{cases} 0, \text{if } i \neq j \\ 1, \text{if } i = j \end{cases}$	1
2	If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, then A^{-1} is: A. $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ B. $30\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ C. $\frac{1}{30}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ D. $\frac{1}{30}\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$	1
3	For any square matrix A, $(A - A^T)^T$ is always: A. An identity matrix B. A null matrix C. A skew symmetric matrix D. symmetric matrix	1

4	If $A.(\text{adj } A) = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then the value of $\|A\| + \|\text{adj } A\|$ is equal to: A. 12 B. 9 C. 3 D. 27	1
5	Let, A be the area of a triangle having vertices $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3). Which of the following is correct? A. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm A$ B. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm 2A$ C. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm \frac{A}{2}$ D. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = A^2$	1
6	The value of k for which the function $f(x) = \begin{cases} x^2, x \geq 0 \\ kx, x < 0 \end{cases}$ is differentiable at $x = 0$ is: A. 1 B. 2 C. Any real number D. 0	1
7	If $y = \frac{\cos x - \sin x}{\cos x + \sin x}$, then $\frac{dy}{dx}$ is: A. $-\sec^2\left(\frac{\pi}{4} - x\right)$ B. $\sec^2\left(\frac{\pi}{4} - x\right)$ C. $\ln\left\|\sec\left(\frac{\pi}{4} - x\right)\right\|$ D. $-\ln\left\|\sec\left(\frac{\pi}{4} - x\right)\right\|$	1
8	$\int 2^{x+2} dx$ is equal to: A. $2^{x+2} + c$ B. $2^{x+2} \ln 2 + c$ *C.* $\frac{2^{x+2}}{\ln 2} + c$ D. $2.\frac{2^x}{\ln 2} + c$	1
9	$\int_0^2 \sqrt{4 - x^2}\, dx$ equals: A. $2\ln 2$ B. $-2\ln 2$ C. $\frac{\pi}{2}$ D. π	1
10	What is the product of the order and degree of the differential equation $\frac{d^2y}{dx^2}\sin y + \left(\frac{dy}{dx}\right)^3 \cos y = \sqrt{y}$? A. 3 B. 2 C. 6 D. Not defined	1
11	$x \ln x \frac{dy}{dx} + y = 2\ln x$ is an example of a: A. Variable separable differential equation. B. Homogeneous differential equation. C. First order linear differential equation. D. Differential equation whose degree is not defined.	1

12.	If the point $P(a, b, 0)$ lies on the line $\frac{x+1}{2} = \frac{y+2}{3} = \frac{z+3}{4}$, then (a, b) is: A. $(1, 2)$ B. $\left(\frac{1}{2}, \frac{2}{3}\right)$ C. $\left(\frac{1}{2}, \frac{1}{4}\right)$ D. $(0, 0)$	1
13.	If $P(A \cap B) = \frac{1}{8}$ and $P(A') = \frac{3}{4}$, then $P\left(\frac{B}{A}\right)$ is equal to: A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{6}$ D. $\frac{2}{3}$	1
14	In ΔABC, $\overrightarrow{AB} = \hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{AC} = 3\hat{i} - \hat{j} + 4\hat{k}$. If D is the mid-point of BC, then $\overrightarrow{AD}$ is equal to: A. $4\hat{i} + 6\hat{j}$ B. $2\hat{i} - 2\hat{j} + 2\hat{k}$ C. $\hat{i} - \hat{j} + \hat{k}$ D. $2\hat{i} + 3\hat{k}$	1
15	If α, β and γ are the angles which a line makes with positive directions of x, y and z axes respectively, then which of the following is not true? A. $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$ B. $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$ C. $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = -1$ D. $\cos\alpha + \cos\beta + \cos\gamma = 1$	1
16	The restrictions imposed on decision variables involved in an objective function of a linear programming problem are called: A. Feasible solutions B. Constraints C. Optimal solutions D. Infeasible solutions	1
17	Besides non negativity constraints, the figure given below is subject to which of the following constraints  A. $x + 2y \leq 5; x + y \leq 4$ B. $x + 2y \geq 5; x + y \leq 4$ C. $x + 2y \geq 5; x + y \geq 4$ D. $x + 2y \leq 5; x + y \geq 4$	1
18	If A and B are independent events, then which of the following is not true? A. A' and B are independent events. B. A and B' are independent events. C. A' and B' are independent events. D. None of these	1

	Question number 19 and 20 are Assertion and Reason based question. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answers from the codes 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 and R is false. D. A is false and R is true.	
19	**Assertion**$(\mathbf{A})$: The relation $\mathrm{R}=\{(1,2)\}$ on the set $\mathrm{A}=\{1,2,3\}$ is transitive. **Reasoning** $(\mathbf{R})$: A relation R on a non-empty set A is said to be transitive if $(\mathrm{a},\mathrm{b}),(\mathrm{b},\mathrm{c}) \in \mathrm{R} \Rightarrow (\mathrm{a},\mathrm{c}) \in \mathrm{R}$, for all $\mathrm{a},\mathrm{b},\mathrm{c} \in \mathrm{A}$.	1
20	**Assertion**$(\mathbf{A})$: The function $\mathrm{f}(\mathrm{x})=(\mathrm{x}+2)\mathrm{e}^{-\mathrm{x}}$ is strictly increasing on $(-1,\infty)$. **Reasoning** $(\mathbf{R})$: A function $\mathrm{f}(\mathrm{x})$ is strictly increasing if $\mathrm{f}'(\mathrm{x})>0$.	1
	SECTION-B	
21	Find the principal value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$. **OR** Find the value of $\tan^{-1}(\sqrt{3})-\sec^{-1}(-2)$.	2
22	If $\mathrm{x}=\mathrm{a}\tan^3\theta$ and $\mathrm{y}=\mathrm{a}\sec^3\theta$, then find $\frac{dy}{\mathrm{dx}}$.	2
23	Evaluate : $\int\frac{\sec^2\mathrm{x}}{\sqrt{\tan^2\mathrm{x}+4}}\mathrm{dx}$ **OR** $\int\sqrt{1-\sin 2\mathrm{x}}\,\mathrm{dx}, \frac{\pi}{4}<\mathrm{x}<\frac{\pi}{2}$.	2
24	If $\lvert\vec{a}\rvert=2, \lvert\vec{b}\rvert=7$ and $\vec{a}\times\vec{b}=-3\hat{\imath}+\hat{\jmath}+2\hat{k}$, find the angle between $\vec{a}$ and $\vec{b}$.	2
25	Let X be a random variable which assumes values x_1,x_2,x_3,x_4 such that $2\mathrm{P}(\mathrm{X}=x_1)=3\mathrm{P}(\mathrm{X}=x_2)=\mathrm{P}(\mathrm{X}=x_3)=5\mathrm{P}(\mathrm{X}=x_4)$. Find the probability distribution of X. **OR** A die, whose faces are marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let, A be the event “number obtained is even” and B be the event “number is marked red”. Find whether the events A and B are independent or not.	2

SECTION-C		
26	If $(\cos y)^x = (\sin x)^y$, then find $\frac{dy}{dx}$.	3
27	Find the intervals in which the function f(x) = $3x^4 - 4x^3 - 12x^2 + 5$ is I. strictly increasing II. strictly decreasing	3
28	Evaluate: $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{16 + 9\sin 2x} dx$ **OR** $\textbf{Prove that } \int_0^a f(x)\, dx = \int_0^a f(a-x)\, dx, \text{and hence evaluate } \int_0^1 x^2(1-x)^n\, dx.$	3
29	Find the area of the region $\{(x, y): y \geq x^2, y \leq \|x\|\}$ **OR** If the area bounded by the parabola $y^2 = 16ax$ and the line $y = 4mx$ is $\frac{a^2}{12}$ sq. units, then using integration, find the value of m.	3
30	Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x^2 + y^2 + x^2y^2$, given that $y = 0$ when $x = 1$. **OR** Find the particular solution of the differential equation $x\frac{dy}{dx} \sin\left(\frac{y}{x}\right) + x - y\sin\left(\frac{y}{x}\right) = 0$, given that $y(1) = \frac{\pi}{2}$.	3
31	Maximize $Z = 3x + 9y$ Subject to constraints $x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x, y \geq 0$ Solve the above L.P.P graphically.	3
SECTION-D		
32	Let $\mathbb{N}$ be the set of natural numbers and R be the relation on $\mathbb{N} \times \mathbb{N}$ defined by $(a, b)\ R\ (c, d)$ iff $ad = bc$ for all $a, b, c, d \in \mathbb{N}$. Show that R is an equivalence relation. **OR** Show that the function $f: \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(x) = x^2 + x + 1$ is one-one but not onto.	5
33	If $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 3 \\ 1 & -2 & 1 \end{bmatrix}$, then find A^{-1} and hence solve the system of system of linear equations: $x + y + z = 6, y + 3z = 7$ and $x - 2y + z = 0$.	5

34	Evaluate: $$\int_1^4 [\lvert x-1\rvert + \lvert x-2\rvert + \lvert x-3\rvert]\, dx$$	5
35	Find the co-ordinates of the foot of the perpendicular drawn from the point $A(-1,8,4)$ to the line joining points $B(0,-1,3)$ and $C(2,-3,-1)$. Hence find the image of the point A in the line BC.	5
	SECTION-E	
36	Read the following passage and answer the questions given below: In an Office three employees Jayant, Sonia and Olivia process a calculation in an excel form. Probability that Jayant, Sonia, Olivia process the calculation respectively is 50%, 20% and 30% . Jayant has a probability of making a mistake as 0.06, Sonia has probability 0.04 to make a mistake and Olivia has a probability 0.03. Based on the above information, answer the following questions. I. Find the probability that Sonia processed the calculation and committed a mistake. II. Find the total probability of committing a mistake in processing the calculation. III. The boss wants to do a good check. During check, he selects a calculation form at random from all the days. If the form selected at random has a mistake, find the probability that the form is not processed by Jayant.	 1 1 2
37	A girl walks 3 km towards west to reach point A and then walks 5 km in a direction 30° east of north and stops at point B. Let the girl starts from O (origin) and take $\hat{\imath}$ along east and $\hat{\jmath}$ along north.  Based on the above information, answer the following questions. I. Find the scalar components of $\overrightarrow{AB}$. II. Find the unit vector along $\overrightarrow{AB}$. III. Find the position vector of point B.	 1 1 2

38 In order to set up a rain water harvesting system, a tank to collect rain water is to be dug. The tank should have a square base and a capacity of 250 cubic m. The cost of land is Rs 5000 per sq m and cost of digging increase with depth and for the whole tank it is 40,000 h^2 , where h is the depth of the tank in metres. x is the side of the square base of the tank in metres.

Based on the above information answer the following questions:

I. Find the total cost C of digging the tank in terms of x.

II. Find the value of x for which cost C is minimum 2

OR

Check whether the cost function C(x) expressed in terms of x increasing or not, where x >0. 2