केंद्रीय विद्यालय संगठन, अहमदाबाद संभाग

KENDRIYA VIDYALAYA SANGATHAN, AHMEDABAD REGION

प्री-बोर्ड परीक्षा:2024-25

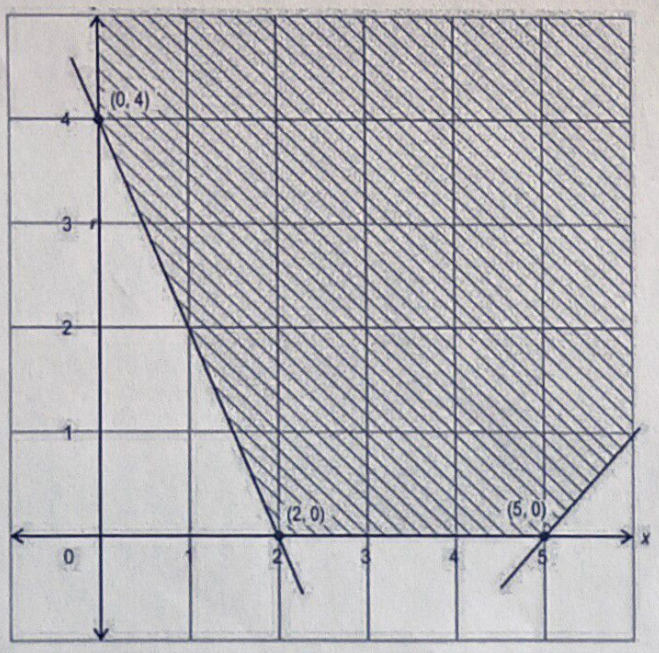
PRE-BOARD EXAMINATION: 2024-25

SUBJECT : MATHEMATICS(041) TIME : 3 HOURS
CLASS : XII MM : 80

General Instructions:

1. This question paper contains – **FIVE Sections** A,B,C,D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has **18 MCQ's and 02** Assertion –Reason based questions of 1 mark each.
3. **Section-B** has **5 Very Short Answer (VSA) –type questions of 2 marks each**
4. **Section-C** has **6 Short Answer (SA) –type questions of 3 marks each.**
5. **Section-D** has **4 Long Answer (LA) –type questions of 5 marks each.**
6. **Section E** has **3 source based/case based /passage based/integrated units of assessment** (4 marks each) with sub parts.

	Q No.	**SECTION-A** **(This section comprises of multiple-choice questions of 1 mark each)**	Marks
	Q 1	Given $A = \begin{bmatrix} 4 & 2 & 5 \\ 2 & 0 & 3 \\ -1 & 1 & 0 \end{bmatrix}$, the value of $\det(2AA^{-1})$ is (a) 2 (b) 9 (c) 8 (d) 4	1
	Q 2	For which of these vectors is the projection on the y-axis zero? (i) $2\hat{j}$ (ii) $-5\hat{k}$ (iii) $\hat{\imath} - 4\hat{k}$ (a) Only (i) (b) Only (ii) (c) Only (i) and (ii) (d) Only (ii) and (iii)	1

Q 3	The value of $\sin^{-1}(\sin(5\pi/4))$ is: (a) $5\pi/4$ (b) $3\pi/4$ (c) $-\pi/4$ (d) $\pi/4$	
Q 4	M and N are two events such that $P(M \cap N) = 0$ Which of the following is equal to $P(M \mid M \cup N)$? (a) $\frac{P(M)}{P(N)}$ (b) $\frac{P(N)}{P(M \cup N)}$ (c) $\frac{P(M)}{P(M)+P(N)}$ (d) $\frac{P(M)}{P(M)\,P(N)}$	1
Q 5	A is a 3 X 4 matrix . A matrix B is such that A′ B and B A′ are defined then order of B is (a) 3 X 4 (b) 3 X 3 (c) 4 X 4 (d) 4 X 3	1
Q 6	A linear programming problem (LPP) along with the graph of its constraints is shown below. The corresponding objective function is Minimize: Z = 3x + 2y. The minimum value of the objective function is obtained at the corner point (2, 0).  The optimal solution of the above linear programming problem is _____	1

	(a) does not exist as the feasible region is unbounded. (b) does not exist as the inequality $3x + 2y < 6$ does not have any point in common with the feasible region. (c) exists as the inequality $3x + 2y > 6$ has infinitely many points in common with the feasible region. (d) exists as the inequality $3x + 2y < 6$ does not have any point in common with the feasible region.	
Q 7	If $f(x) = \cos^{-1}\sqrt{x}$, $0< x < 1$, which of the following is equal to $f'(x)$? (a) $\frac{-1}{\sqrt{1-x}}$ (b) $\frac{1}{\sqrt{1-x}}$ (c) $\frac{1}{2\sqrt{x(1-x)}}$ (d) $\frac{-1}{2\sqrt{x(1-x)}}$	1
Q 8	$\int_0^{2\pi} cosec^7 x \, dx =$ (a) 0 (b) 1 (c) 4 (d) 2π	1
Q 9	The interval in which function $y=x^2e^{-x}$ is increasing is: (a) $(-\infty,\infty)$ (b)(-2,0) (c) $(2,\infty)$ (d) (0,2)	1
Q 10	The value of b for which the function $f(x) = \begin{cases} 5x-4 & 0<x\leq 1 \\ 4x^2+3bx & 1<x<2 \end{cases}$ is continuous at every point of its domain is (a) -1 (b) 0 (c) 13/3 (d) 1	1
Q 11	The degree of the differential equation $(y'')^2 + (y')^3 = xsin(y')$ is: (a) 1 (b) 2 (c) 3 (d) not defined	1
Q 12	The area of the region bounded by the parabola $y = x^2$ and $x = -1$, $x = 2$ and x-axis is a) 3 sq units b) 5 sq units	1

		c) 7 sq units d) 3/2 sq units	
	Q 13	Kapila is trying to find the general solution of the following differential equations. (i) $xe^{\frac{x}{y}}\,dx - y\,e^{\frac{3x}{y}}\,dy = 0$ (ii) $(2x+1)\frac{dy}{dx} = 3 - 2y$ (iii) $\frac{dy}{dx} = \sin x - \cos y$ Which of the above become variable separable by substituting y = bx where b is variable ? (a) Only (i) (b) Only (i) and (ii) (c) All –(i) , (ii) and (iii) (d) None of the above	1
	Q 14	$\int \frac{e^x(1+x)}{\cos^2(xe^x)}\,dx$ = (a) $-\cot(x\,e^x) + c$ ~~(b)~~ $\tan(x\,e^x) + c$ (c) $\tan(e^x) + c$ (d) $\cot(e^x) + c$	1
	Q 15	If $A = \begin{bmatrix} 0 & 1 & c \\ -1 & a & -b \\ 2 & 3 & 0 \end{bmatrix}$ is a skew symmetric matrix then the value of a +b + c = (a) 4 (b) 3 (c) 2 (d) 1	1
	Q 16	The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5,5), (15, 15), (0, 20). Let z=px + qy, where p, q> 0. Condition on p and q so that the maximum of z occurs at both the points (15, 15) and (0, 20) is (a) p= q (b) p=2q (c) q=2p (d) q=3p	1
	Q 17	If $\vec{a}$ and $\vec{b}$ are unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\vec{a} - \vec{b}$ to be a unit vector? a) 30 °	1

		b) 45 ° c) 60 ° d) 90 °	
	Q 18	$\int e^x (log\ sinx + cot\ x)\ dx$ is (a) $e^x \log sinx + C$ (b) $e^x\ cot\ x + C$ (c) $e^x\ tan\ x + C$ (d) $e^x\ (log\ cos\ x - cot\ x) + C$	1
		ASSERTION - REASON BASED QUESTIONS	
		In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (a)Both A and R are true and R is correct explanation for A (b)Both A and R are true but R is not correct explanation for A (c)A is true but R is false. (d)A is false but R is true	
	Q 19	**Assertion(A)**: A relation R = {(a, b) :|a−b|< 2} defined on the set A = {1,2,3,4,5} is reflexive. **Reason (R)**: A relation on the set A is said to be reflexive if (a, a) ∈ R ∀ a ∈ A	1
	Q 20	**Assertion(A)**: The maximum value of the function f(x) = x^5 , x ∈ [-1,1] ,is attained at its critical point, x=0 **Reason (R)**:The maximum of a function may occur at points where derivative is zero.	1
		SECTION B **This section comprises very short answer type-questions (VSA) of 2 marks each**	
	Q 21	Find the domain of the function defined by f(x)=$\sin^{-1}\sqrt{x-1}$	2
	Q 22	If f(x) = |cos x| , find $f'\left(\frac{3\pi}{4}\right)$	2
		OR	
		If $x^y = e^{x-y}$ then prove that $\frac{dy}{dx} = \frac{\log x}{(1+logx)^2}$	2
	Q 23	Find the value of λ so that the lines given below are perpendicular $\frac{(1-x)}{3} = \frac{(7y-14)}{\lambda} = \frac{(z-3)}{2}$ $\frac{(7-7x)}{3\lambda} = \frac{(y-5)}{1} = \frac{(6-z)}{5}$	2

	Q 24	Find the area of a parallelogram whose diagonals are $2\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}+3\hat{j}-\hat{k}$	3
		OR	
		If $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors such that $\vec{a}+\vec{b}+\vec{c}=0$, $\lvert\vec{a}\rvert=3, \lvert\vec{b}\rvert=5$ & $\lvert\vec{c}\rvert=7$ find the angle between $\vec{a}$ and $\vec{b}$	2
	Q 25	If A= $\begin{bmatrix}3 & -2\\ 4 & -2\end{bmatrix}$ and I is Identity matrix of order 2, then find k so that $A^2 = kA - 2I$	2
		SECTION C **This section comprises short answer type-questions (SA) of 3 marks each**	
	Q 26	Let $\vec{a}=\hat{i}-\hat{j}$, $\vec{b}=3\hat{j}-\hat{k}$ and $\vec{c}=7\hat{i}+\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c}\cdot\vec{d}=1$.	3
		OR	
		Find the vector and cartesian equation of the straight line passing through the point (-5, 7, -4) and (3, -2, 1). Also find the point where this straight line crosses the xy-plane.	3
	Q 27	The relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the following equation $y=4x-\frac{1}{2}x^2$ where x is the number of days exposed to sunlight. (i) What will be the rate of growth of the plant with respect to sunlight ? (ii)What will be the height of plant after 2 days?	3
	Q 28	If x = cot t and y = $cosec^2$ t find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$	3
	Q 29	Solve the following linear programming problem graphically: Minimise z = 200 x + 500 y subject to the constraints : $x + 2y \geq 10$ $3x + 4y \leq 24$ $x \geq 0, y \geq 0$	3
	Q 30	Find the area bounded by the curve $y = x\lvert x\rvert$, x axis and the ordinates x = -1 and x = 1	3
		OR	
		Find the area of the region bounded by the line y = 3x + 2, the x-axis and the ordinates x = −1 and x = 1.	3
	Q 31	The probability of simultaneous occurrence of at least one of the two events A and B is p. If the probability that exactly one of A,B occurs is q , then prove that $P(A') + P(B') = 2-2p+q$	3
		OR	
		From a lot of 10 bulbs which includes 2 defectives, a sample of 2 bulbs is drawn at random without replacement. Find the	3