केन्द्रीय विद्यालय संगठन, बेंगलूरु संभाग

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प्रथम प्री-बोर्ड परीक्षा (2025-26)

FIRST PRE BOARD EXAMINATION (2025-26)

CLASS:XII MAX MARKS:80

SUBJECT : MATHEMATICS TIME : 3 HRS

General Instructions :

Read the following instructions very carefully and strictly follow them:

(i) This Question paper contains 38 questions. All questions are compulsory.

(ii) This Question paper is divided into five Sections - A, B, C, D and E.

(iii) In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.

(iv) In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.

(v) In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.

(vi) In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.

(vii) In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.

(viii) 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.

(ix) Use of calculators is not allowed

SECTION-A **[1× 20= 20]**

(This section comprises of multiple choice questions (MCQs) of 1 mark each)

Select the correct option (Question 1 - Question 18):

1	The principal value of $\sin^{-1}\left(\cos\frac{43\pi}{5}\right)$ is a) $-\frac{7\pi}{5}$ b) $-\frac{\pi}{10}$ c) $\frac{\pi}{10}$ d) $\frac{3\pi}{5}$	1
2	The matrix $\begin{bmatrix}1 & 0 & 0\\0 & 3 & 0\\0 & 0 & 4\end{bmatrix}$ is a) an identity matrix b) a skew symmetric matrix c) a symmetric matrix d) a scalar matrix	1
3	If $A=\begin{bmatrix}x & 3\\3 & x\end{bmatrix}$ and $\lvert A^3\rvert = 343$, then the value of $x$is a) ± 7 b) ± 3 c) ± 4 d) ± 5	1
4	If P is 3×3 matrix such that $P' = 2P + I$, where P' is the transpose of P , then : a) $P = I$ b) $P = -I$ c) $P = 2I$ d) $P = -2I$	1

5	If $A = \begin{bmatrix} 1 & -2 & 4 \\ 2 & -1 & 3 \\ 4 & 2 & 0 \end{bmatrix}$ is the adjoint of a square matrix B , then B^{-1} is equal to : a) $\pm A$ b) $\pm\sqrt{2}A$ c) $\pm\frac{1}{\sqrt{2}}B$ d) $\pm\frac{1}{\sqrt{2}}A$	1
6	Value of the determinant $\begin{vmatrix} \cos 67° & \sin 67° \\ \sin 23° & \cos 23° \end{vmatrix}$ is a) 0 b) 1 c) -1 d) $\frac{1}{2}$	1
7	If $y = e^{-x}$, then $\frac{d^2y}{dx^2}$ is equal to : a) $-y$ b) y c) x d) $-x$	1
8	If $f(x) = \begin{cases} 1, & if\ x \leq 3 \\ ax + b, & if\ 3 < x < 5 \\ 7, & if\ 5 \leq x \end{cases}$ is continuous in **R** , then the value of a and b are : a) $a = 3, b = -8$ b) $a = 3, b = 8$ c) $a = -3, b = -8$ d) $a = -3, b = 8$	1
9	If the rate of change of volume of a sphere is twice the rate of change of its radius , then the surface area of the sphere is : a) 1 sq unit b) 2 sq units c) 3 sq units 4) 4 sq units	1
10	The solution of the differential equation $xdx + ydy = 0$ represents a family of a) straight lines b) parabolas c) circles d) ellipses	1
11	The value of $\int_0^1 \frac{dx}{e^x + e^{-x}}$ is : a) $-\frac{\pi}{4}$ b) $\frac{\pi}{4}$ c) $\tan^{-1} e - \frac{\pi}{4}$ d) $\tan^{-1} e$	1
12	Antiderivative of $\sqrt{1 + \sin 2x}$, $x \in \left[0, \frac{\pi}{4}\right]$ is a) $cosx + sinx$ b) $-sinx + cosx$ c) $-sinx - cosx$ d) $sinx - \cos x$	1
13	If the direction cosines of a line are $\sqrt{3}k, \sqrt{3}k, \sqrt{3}k$, then the value of k is : a) ± 1 b) $\pm\sqrt{3}$ c) ± 3 d) $\pm\frac{1}{3}$	1
14	The Cartesian equation of the line passing through the point $(1, -3, 2)$ and parallel to the line: $\vec{r} = (2 + \lambda)\hat{\imath} + \lambda\hat{\jmath} + (2\lambda - 1)\hat{k}$ is a) $\frac{x-1}{2} = \frac{y+3}{0} = \frac{z-2}{-1}$ b) $\frac{x+1}{1} = \frac{y-3}{1} = \frac{z+2}{2}$ c) $\frac{x+1}{2} = \frac{y-3}{0} = \frac{z+2}{-1}$ d) $\frac{x-1}{1} = \frac{y+3}{1} = \frac{z-2}{2}$	1
15	The unit vector perpendicular to both vectors $\hat{\imath} + \hat{k}$ and $\hat{\imath} - \hat{k}$ is: a) $2\,\hat{\jmath}$ b) $\hat{\jmath}$ c) $\frac{\hat{\imath} - \hat{k}}{\sqrt{2}}$ d) $\frac{\hat{\imath} + \hat{k}}{\sqrt{2}}$	1
16	If the corner points of the feasible region of an LPP are $(0,3), (3,2)$ and $(0,5)$, then the minimum value of $z = 11x + 7y$ is : a) 21 b) 33 c) 14 d) 35	1
17	The number of solutions of the system of inequations $x + 2y \leq 3$, $3x + 4y \geq 12$, $x \geq 0, y \geq 1$ is a) 0 b) 2 c) finite d) infinite	1
18	If $P(A \cup B) = 0.9$, $P(A \cap B) = 0.4$, then $P(\bar{A}) + P(\bar{B})$ is : a) 0.3 b) 0.7 c) 1.3 d) 1	1

ASSERTION-REASON BASED QUESTIONS

(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) : Domain of $y = \cos^{-1} x$ is $[-1,1]$ Reason (R) : The range of the principal value branch of $y = \cos^{-1} x$ is $[0, \pi] - \left\{\frac{\pi}{2}\right\}$	1
20	Assertion (A) : If $\left\vec{a} \times \vec{b}\right\vert^2 + \left\vec{a}.\vec{b}\right\vert^2 = 256$ and $\left\vec{b}\right\vert = 8$, then $\vert\vec{a}\vert = 2$. Reason (R) : $\sin^2\theta + \cos^2\theta = 1$ and $\left\vec{a} \times \vec{b}\right\vert = \vert\vec{a}\vert \left\vec{b}\right\vert \sin\theta$ and $\left\vec{a}.\vec{b}\right\vert = \vert\vec{a}\vert \left\vec{b}\right\vert \cos\theta$	1

SECTION B [2 × 5 =10]

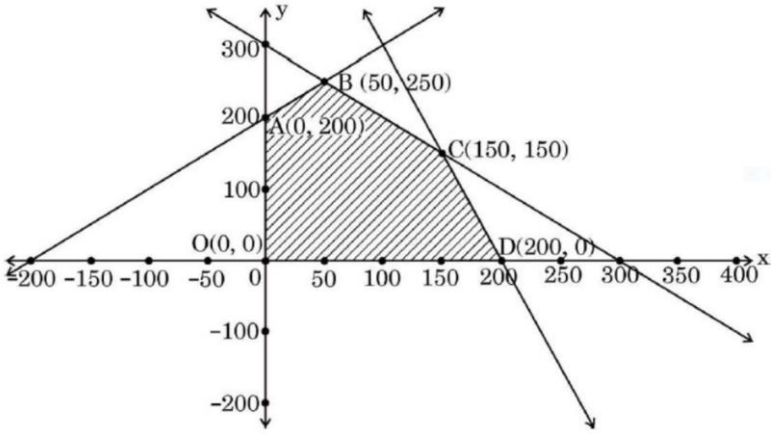
(This section comprises of 5 very short answer (VSA) type questions of 2 marks each.)

21	a) Evaluate : $\sec^2(\tan^{-1} 3) + cosec^2(\cot^{-1} 2)$ **OR** b) Find the principal value of $\cos^{-1}\left(-\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$	2 2
22	If $f(x+y) = f(x)f(y)$ for all $x, y \in \boldsymbol{R}$ and $f(5) = 2, f'(0) = 3$, then using the definition of derivatives, find $f'(5)$.	2
23	a) Find $\int x\sqrt{1+2x}dx$ **OR** b) Calculate the area of the region bounded by the curve $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the x-axis using integration.	2 2
24	Differentiate $y = log\left(x + \sqrt{x^2 + a^2}\right)$ $w.r.t.x.$	2
25	Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c}$ and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, $\vec{a} \neq 0$ Show that $\vec{b} = \vec{c}$	2

SECTION C [3 × 6 =18]

(This section comprises of 6 short answer (SA) type questions of 3 marks each.)

26	a) If $x = e^{\cos 3t}$ and $y = e^{\sin 3t}$, prove that $\frac{dy}{dx} = -\frac{y\,logx}{x\log y}$ **OR** b) If $y = A\sin 2x + B\cos 2x$ and $\frac{d^2y}{dx^2} - ky = 0$, find the value of k.	3 3
27	Find the interval/intervals in which the function $f(x) = \sin 3x - \cos 3x$, $0 < x < \frac{\pi}{2}$ is strictly increasing .	3
28	a) Sketch the graph of $y = \vert x+3\vert$ and find the area of the region enclosed by the curve , x-axis , between $x = -6$ and $x = 0$, using integration . **OR** b) Using integration find the area of the region $\{(x,y): x^2 - 4y \leq 0, y - x \leq 0\}$	3 3
29	a) Find the distance of the point $P(2,4,-1)$ from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$	3

	OR b) Find the distance of the point $(-1,-5,-10)$ from the point of intersection of the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-1}{2}=z$.	3
30	 For the given graph of a linear programming problem , write all constraints satisfying the given conditions.	3
31	A person is head of two independent selection committees I and II . If the probability of making a wrong selection in committee I is 0.03 and that in committee II is 0.01 , then find the probability that the person makes the correct decision of selection : (i) in both committee (ii) in only one committee	3

SECTION D [5 × 4 =20]

(This section comprises of 4 long answer (LA) type questions of 5 marks each.)

32	If $A=\begin{bmatrix}2 & -3 & 5\\ 3 & 2 & -4\\ 1 & 1 & -2\end{bmatrix}$, then find A^{-1} . Using A^{-1} , solve the system of equations: $2x-3y+5z=11$ $3x+2y-4z=-5$ $x+y-2z=-3$	5
33	a) Evaluate $\int_0^1 \frac{log(1+x)}{1+x^2}dx$ **OR** b) Find $\int \frac{x^2+1}{(x-1)^2(x+3)}dx$	5 5
34	a) Solve the differential equation $(x-siny)dy+tany\,dx=0$, given $y(0)=0$ **OR** b) Solve the differential equation $\frac{dy}{dx}=cosx-2y$	5 5
35	Find the coordinates of the image of the point $(1,6,3)$ with respect to the line $\vec{r}=(\hat{j}+2\hat{k})+\lambda(\hat{i}+2\hat{j}+3\hat{k})$, where λ is a scalar . Also find the distance of the image from the y −axis.	5

SECTION E [4 × 3 =12]

(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	Rajesh , a student of class XII , visited an exhibition with his family . There he saw a huge swing and found that it traced the path of a parabola $y = x^2$. The following questions came to his mind . Answer the following questions : (i) Let $f: \boldsymbol{R} \to \boldsymbol{R}$ be a function defined as $f(x) = x^2$. Find whether f is one-one function . (ii) Let $f: \boldsymbol{R} \to \boldsymbol{R}$ be a function defined as $f(x) = x^2$. Find whether f is an onto function . (iii) a) Let $f: \boldsymbol{N} \to \boldsymbol{N}$ be a function defined as $f(x) = x^2$. Find whether f is one one function . Also , find it is an onto function . **OR** (iii) Let $f: \boldsymbol{N} \to \{1,4,9,16 \ldots\}$ be a function defined as $f(x) = x^2$. Find whether f is one one function . Also , find it is an onto function .	1 1 2 2
37	A carpenter needs to make a wooden cuboidal box , closed from all sides , which has a square base and fixed volume . Since he is short of the paint required to paint the box on completion , he wants the surface area to be minimum. On the basis of the above information , answer the following questions : (i) Taking length = breadth = $x\ m$ and height = $y\ m$, express the surface area (S) of the box in terms of x and its volume (V) ,which is constant. (ii) Find $\frac{dS}{dx}$ (iii) a) Find a relation between x and y such that the surface area (S) is minimum. **OR** (iii) b) If surface area (S) is constant , the volume (V) $= \frac{1}{4}(Sx - 2x^3)$, x being the edge of base . Show that volume (V) is maximum for $x = \sqrt{\frac{S}{6}}$	1 1 2 2
38	A shop selling electronic items sells smartphones of only three reputed companies A,B and C because chances of their manufacturing a defective smartphone are only $5\%, 4\%$ and 2% respectively . In his inventory he has 25% smartphones from company A , 35% smartphones from company B and 40% smartphones from company C . A person buys a smartphone from this shop. (i) Find the probability that it was defective (ii) What is the probability that this defective smartphone was manufactured by Company B ?	2 2

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