KENDRIYA VIDYALAYA SANGATHAN SILCHAR REGION
PRE – BOARD EXAMINATION 2025 –2026
SUBJECT – MATHEMATICS (041)
CLASS - XII

Time Allowed : 3 Hours — Maximum Marks : 80

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 Question no. 19 and 20 are Assertion – Reason based questions of 1 mark each.
4. In Section B, Question no. 21 to 25 are Very Short Answer (VSA) – type questions, carrying 2 marks each.
5. In Section C, Question no. 26 to 31 are Short Answer (SA) – type questions, carrying 3 marks each.
6. In Section D, Question no. 32 to 35 are Long Answer (LA) – type questions, carrying 5 marks each.
7. In Section E, Question 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 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(MCQ)s of 1 mark each

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

Q.No.	Question	Marks
1	The value of $\sin^{-1}[\sin(\frac{17\pi}{8})]$ is (a) $\frac{17\pi}{8}$ (b) $\frac{\pi}{8}$ (c) $-\frac{\pi}{8}$ (d) $\frac{13\pi}{8}$	1
2	If the order of matrix A is m × p and the order of B is p × n. Then the order of matrix AB is? (a) n × p (b) m × n (c) n × p (d) n × m	1
3	Let A be a skew symmetric matrix of order 3. If |A| = x, then $(2023)^x$ is (a) 2023 (b) $\frac{1}{2023}$ (c) 2023^2 (d) 1	1
4	If A is a non-singular square matrix of order 3 such that $\|adjA\| = 64$ then the value of $\|A\|$ is (a) 8 (b) –8 (c) ± 8 (d) 4	1
5	If the points (2, -3), (k, -1) and (0, 4) are collinear, then find the value of 4k. (a) 4 (b) $\frac{7}{140}$ (c) 47 (d) $\frac{40}{7}$	1
6	Let A be a square matrix of order 3 x 3 such that $\|A\| = 2$ the value of $\|4A\|$? (a) 128 (b) 64 (c) 8 (d) 16	1
7	What value of k, the function f(x) = $\begin{cases} kx^2, if\ x \le 2 \\ 3,\ if\ x > 2 \end{cases}$, is continuous at x=2. (a) 0 (b) 1 (c) $\frac{3}{4}$ (d) $\frac{3}{2}$	1
8	If $y = \left(1+\frac{1}{x}\right)^x$, then $\frac{dy}{dx} =$ (a) $(1+\frac{1}{x})^x[\log(1+\frac{1}{x}) - \frac{1}{x+1}]$ (b) $(1+\frac{1}{x})^x[\log(1+\frac{1}{x})]$ (c) 0 (d) 1	1

9	The interval on which the function $f(x) = x^2 - 4x + 6$ is strictly increasing is (a) $(-\infty, 2) \cup (2, \infty)$ (b) $(2, \infty)$ (c) $(-\infty, 2)$ (d) $(-\infty, 2] \cup (2, \infty)$	1
10	Integrating factor of the differential equation $\frac{dy}{dx} + y\, tanx - secx = 0$ *is* (a) $cosx$ (b) $secx$ (c) e^{cosx} (d) e^{secx}	1
11	If $\frac{d}{dx}$ [f(x)] = ax + b and f(0) = 0 , then f(x) is equal to (a) a+b (b) $\frac{ax^2}{2}$ + bx (c) $\frac{ax^2}{2}$ + bx + C (d) b	1
12	What is the value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^9 x\, dx$ (a) 0 (b)1 $(c) -1$ (d) 2	1
13	The projection of the vector $\vec{a} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ on $\vec{b} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$ is : (a) $\frac{\sqrt{5}}{2}$ (b) $\frac{5}{\sqrt{2}}$ (c) $\frac{5}{\sqrt{6}}$ (d) $\frac{\sqrt{6}}{5}$	1
14	The value of $(\hat{\imath} \times \hat{\jmath}) \cdot \hat{\jmath} + (\hat{\jmath} \times \hat{\imath}) \cdot \hat{k}$ is (a) 2 (b) 0 (c) 1 (d) -1	1
15	The value of p for which the vectors $2\hat{\imath} + p\hat{\jmath} + \hat{k}$ and $-4\hat{\imath} - 6\hat{\jmath} + 26\hat{k}$ are perpendicular to each other, is (a) 3 (b) -3 (c) $\frac{-17}{3}$ (d) $\frac{17}{3}$	1
16	The solution set of the inequality $3x + 4y < 4$ is (a) An open half-plane not containing the origin (b) An open half-plane containing the origin (c) The whole xy plane not containing the line $3x + 4y = 4$ (d) A closed half-plane containing the origin	1
17	Objective function of an LPP is ______ (a) a constraint (b) a function which is to be optimized. (c) a relation between variables. (d) none of these.	1
18	If P(A ∩ B) = 70% and P(B) = 85%, then P(A/B) is equal to (a) $\frac{14}{17}$ (b) $\frac{17}{20}$ (c) $\frac{7}{8}$ (d) $\frac{1}{8}$	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): All trigonometric functions have their inverses over their respective domains. Reason(R): The inverse of $\tan^{-1}x$ exists for some x ϵ R	1
20	Assertion(A): The area of parallelogram with diagonals $\vec{a}$ and $\vec{b}$ is $\|\vec{a} \times \vec{b}\|$. Reason(R): If $\vec{a}$ and $\vec{b}$ represent the adjacent sides of a triangle, then the area of a triangle,	1

	then the area of triangle can be obtained by evaluating $\frac{1}{2}\left\|\vec{a} \times \vec{b}\right\|$.	
SECTION – B **(This section comprises of 5 very short answer (VSA) type questions of 2 marks each.)**		
21	(a) Find the value of $\tan^2(\sec^{-1} 2) + \cot^2(\mathrm{cosec}^{-1} 3)$). **OR** (b) Find the domain of $\cos^{-1}(3x – 2)$	2 2
22	If $\sin y = x \sin (a+y)$, prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$	2
23	Evaluate : $\int \frac{(x^2+1)e^x}{(x+1)^2}\, dx$ **OR** Evaluate $\int_{-1}^{2} \left\|x^3 - x\right\| dx$.	2 2
24	Find the values of a and b such that the function defined by f(x) = $\begin{cases} 5, & if \quad x \le 2 \\ ax+b, & if\ 2 < x < 10 \\ 21, & if \quad x \ge 10 \end{cases}$ is a continuous function.	2
25	Prove that $(\vec{a} - \vec{b}) \times (\vec{a} + \vec{b}) = 2(\vec{a} \times \vec{b})$	2
SECTION – C **(This section comprises of 6 short answer (SA) type questions of 3 marks each.)**		
26	(a) If $y = \sqrt{\frac{1-x}{1+x}}$, prove that $(1 - x^2)\frac{dy}{dx} + y = 0$. **OR** (b) Find $\frac{dy}{dx}$ if $(\cos x)^y = (\cos y)^x$	3 3
27	Find the intervals in which the function f given by $f(x) = 2x^3 - 9x^2 + 12x + 15$ is (i) strictly increasing , or (ii) strictly decreasing.	3
28	(a) Find the area of the region bounded by the ellipse $\frac{y^2}{16} + \frac{x^2}{25} = 1$. OR (b) Find the area of the region in the first quadrant enclosed by the $x -$ axis, line $x = \sqrt{3}y$ and the circle $x^2 + y^2 = 4$.	3 3
29	(a) Find the shortest distance between the following lines whose vector equation are given: $\vec{r} = (2\hat{\imath} + 4\hat{\jmath} - 8\hat{k}) + \beta\,(2\hat{\imath} + 3\hat{\jmath} + 6\hat{k})$ $\quad \vec{r} = (\hat{\imath} - 2\hat{\jmath} - 4\hat{k}) + \alpha\,(\hat{\imath} + 2\hat{\jmath} + 4\hat{k})$ **OR** (b) Find the image of the point (1, 6, 3) in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.	3 3
30	Maximize $Z = 3x + 2y$ Subject to $x + 2y \le 10$, $3x + y \le 15$,	3

	$x, y \geq 0.$	
31	A die marked 1,2,3 in red and 4,5,6 in green is tossed. Let A be the event "numbers even" and B be the event" numbers are marked red". Find whether the event A and B are independent or not.	3
SECTION – D **(This section comprises of 4 long answer (LA) type questions of 5 marks each.)**		
32	If A= $\begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ find A^{-1}. Hence solve the given equations $2x - 3y + 5z = 11;$ $3x + 2y - 4z = -5;$ $x + y - 2z = -3.$	5
33	(a) Evaluate: $\int_0^{\pi} \frac{x.Sin\ x}{1+Cos^2 x} dx$ **OR** (b) Evaluate : $\int \frac{2x}{(x^2+3)(x^2-5)} dx$	5 5
34	(a) Solve the differential equation : (x dy – y dx) y sin $(\frac{y}{x})$ = (y dx + x dy) x cos $(\frac{y}{x})$ OR (b) Find the particular solution of the differential equation $\frac{dy}{dx}$ + y cotx = 2x + x^2 cotx (x≠0), given that y = 0 when x = $\frac{\pi}{2}$.	5 5
35	Find the vector equation of the line passing through the point P $(1, 2, -4)$ and perpendicular to the two lines : $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$.	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	In general election of Lok Sabha in 2019, about 911 million people were eligible to vote and voter turnout was about 67%, the highest ever. Let A be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation 'R' is defined on A as follows: R = {(V_1, V_2) :V_1, V_2 ∈A and both use their voting right in general election 2019}  Read the above passage and answer the following questions. **(i**) Mr.'X' and his wife 'W'both exercised their voting right in general election -2019, Which of the following is true? (a) (X,W) ∈ R but (W,X) ∉ R (b) (X,W) ∈ and (W,X) ∈ R (c) (X,W) ∉ R and (W,X) ∉ R (d) (W,X) ∈ R but (X,W) ∉ R	 1

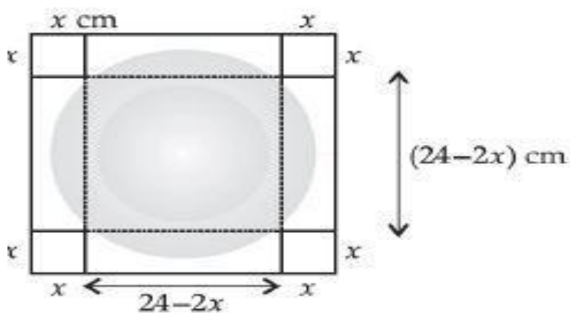
(ii) Three friends F1, F2 and F3 exercised their voting right in general election-2019, then which of the following is true?
(a) (F1,F2) ∈R, (F2,F3) ∈ R and (F1,F3) ∈ R
(b) (F1,F2) ∈ R, (F2,F3) ∈ R and (F1,F3) ∉ R 1
(c) (F1,F2) ∈ R, (F2,F2) ∈R but (F3,F3) ∉ R
(d) (F1,F2) ∉ R, (F2,F3) ∉ R and (F1,F3) ∉ R

(iii) Mr. John exercised his voting right in General Election – 2019, then Mr. John is related to which of the following?
(a) Eligible voters of India (b) Family members of Mr. John
(c) All citizens of India (d) All those eligible voters who cast their votes 2

OR

The relation R = $\{(V_1, V_2) : V_1, V_2 \in$A and both use their voting right in general election – 2019$\}$ is _____
(a) symmetric but not reflexive (b) reflexive, symmetric but not transitive
(c) equivalence relation (d) neither reflexive nor symmetric nor transitive 2

37 An open box is to be made out of a piece of cardboard measuring 24 cm x 24 cm by cutting of equal squares from the corners and turning up the sides.



Based on this information answer the following questions:

(i) Find the volume V(x) of the open box. 1
(ii) Find the value of $\frac{dV}{dx}$. 1
(iii) Find the value of $\frac{d^2V}{dx^2}$. 2

OR

For what value of the height, the volume of the open box is maximum? 2

38 Read the following text and answer the following question on the basis of the same:
As board examinations are approaching near, students are working hard to score well and they all study together but independently. For one particular problem the probability of solving it correctly are by A, B and C are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{5}$ respectively. If all the three try, then :

	 (i) What is the probability that exactly two will solve the problem ? (ii) What is the probability problem will be solved?	2 2