MATHEMATICS – Code: 041
PRACTICE QUESTION PAPER - I CLASS – XII (2025-26)
As per Pattern of CBSE Official Sample Paper 2025-2026

MAX. MARKS : 80 **DURATION: 3 HRS**

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.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. Find the cofactor of a_{12} in the following: $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$

(a) -46 (b) 46 (c) 0 (d) 1

2. If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 7 & 11 \\ k & 23 \end{bmatrix}$, then write the value of k.

(a) 17 (b) -17 (c) 13 (d) -13

3. If y = $\sqrt{a^2 - x^2}$, then $y\dfrac{dy}{dx}$ is:

(a) 0 (b) x (c) -x (d) 1

4. If $f(x) = x^2 sin\dfrac{1}{x}$, where x ≠ 0, then the value of the function f at x = 0, so that the function is continuous at x = 0, is

(a) 0 (b) -1 (c) 1 (d) None of these

5. The value of $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$ is

(a) π/6 (b) 0 (c) π/12 (d) None of these

6. If m and n are the order and degree, respectively of the differential equation $y\left(\dfrac{dy}{dx}\right)^3 + x^3\left(\dfrac{d^2y}{dx^2}\right)^2 - xy = \sin x$, then write the value of m + n.

(a) 1 (b) 2 (c) 3 (d) 4

7. The magnitude of each of the two vectors $\vec{a}$ and $\vec{b}$, having the same magnitude such that the angle between them is 60° and their scalar product is 9/2, is

(a) 2 (b) 3 (c) 4 (d) 5

8. Corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5). Let F =4x + 6y be the objective function. The minimum value of F occurs at

(a) Only (0, 2)
(b) Only (3, 0)
(c) the mid-point of the line segment joining the points (0, 2) and (3, 0)
(d) any point on the line segment joining the points (0, 2) and (3, 0)

9. If a line makes angles α, β, γ with the positive direction of co-ordinates axes, then find the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$.

(a) 1 (b) 2 (c) 3 (d) 4

10. The projection of the vector $2\hat{i}+3\hat{j}+2\hat{k}$ *on the vector* $\hat{i}+2\hat{j}+\hat{k}$ is

(a) 10/√6 (b) 10/√3 (c) 5/√6 (d) 5/√3

11. The number of arbitrary constants in the particular solution of a differential equation of third order are

(a) 3 (b) 2 (c) y = 1 (d) y = 0

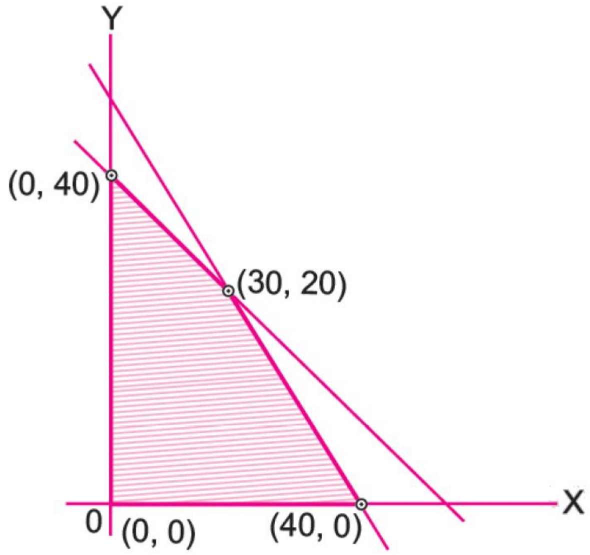
12. The value of is $\int_1^2 \frac{dx}{x\sqrt{x^2-1}}$:

(a) π/3 (b) π/2 (c) π/4 (d) π/6

13. If $x\begin{bmatrix}2\\3\end{bmatrix}+y\begin{bmatrix}-1\\1\end{bmatrix}=\begin{bmatrix}10\\5\end{bmatrix}$, find the value of x.

(a) 1 (b) 2 (c) 3 (d) 4

14. Feasible region (shaded) for a LPP is shown in the given figure.
The maximum value of the Z = 0.4x + y is



(a) 45 (b) 40 (c) 50 (d) 41

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15. If $\begin{vmatrix} 2x+5 & 3 \\ 5x+2 & 9 \end{vmatrix} = 0$, find x.

(a) 13 (b) 3 (c) -13 (d) $\sqrt{3}$

16. If A is a non-singular matrix of order 3 and $|A| = -4$, find $|\text{adj } A|$.

(a) 4 (b) 16 (c) 64 (d) $\frac{1}{4}$

17. The straight line $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$ is:

(a) parallel to x-axis (b) parallel to y-axis
(c) parallel to z-axis (d) perpendicular to z-axis

18. If $|\vec{a}|=10$, $|\vec{b}|=2$ and $\vec{a} \cdot \vec{b}=12$, then the value of $|\vec{a} \times \vec{b}|$ is

(a) 5 (b 10 (c) 14 (d) 16

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 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 angle between the straight lines $\frac{x+1}{2} = \frac{y-2}{5} = \frac{z+3}{4}$ and $\frac{x-1}{1} = \frac{y+2}{2} = \frac{z-3}{-3}$ is 90°.

Reason (R) : Skew lines are lines in different planes which are parallel and intersecting.

20. Assertion (A): Domain of $f(x) = \sin^{-1}x + \cos x$ is [-1, 1]

Reason (R): Domain of a function is the set of all possible values for which function will be defined.

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. If $y = \log(\cos e^x)$, then find $\frac{dy}{dx}$.

22. (A) Prove that the Greatest Integer Function $f : R \longrightarrow R$, given by $f(x) = [x]$ is neither one-one nor onto. Where $[x]$ denotes the greatest integer less than or equal to x.

OR

(B) If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1} x\right) = 1$, then find the value of x.

23. If $|\vec{a} \times \vec{b}|^2 + (\vec{a} \cdot \vec{b})^2 = 144$ and $|\vec{a}| = 4$, then find the value of $|\vec{b}|$.

24. (A) A pair of dice is thrown. Find the probability of getting 7 as the sum, if it is known that the second die always exhibits an odd number.

OR

(B) A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event 'number is even' and B be the event 'number is marked red'. Find whether the events A and B are independent or not.

25. If $xy = \log y + C$, then show that $\frac{dy}{dx} = \frac{y^2}{1-xy}$ (xy not equal to 0)

SECTION – C

Questions 26 to 31 carry 3 marks each.

26. (A) The scalar product of the vector $a = \hat{\imath} + \hat{\jmath} + \hat{k}$ with a unit vector along the sum of the vectors $\vec{b} = 2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\vec{c} = \mu\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is equal to one .Find the value of μ and hence find the unit vector along $\vec{b} + \vec{c}$

OR

(B) Find the points on the line $\frac{(x+2)}{3} = \frac{(y+1)}{2} = \frac{(z-3)}{2}$ at a distance of $3\sqrt{2}$ units from the point P(1, 2, 3)

27. Evaluate: $\int \frac{x^2+1}{(x^2+2)(x^2+3)} dx$.

28. (A) Evaluate: $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$

OR

(B) Evaluate: $\int_1^3 |x^2 - 2x| \, dx$.

29. (A) Find the general solution of the following differential equation; $(x^2 - y^2)dx + 2xy\, dy = 0$

OR

(B) Solve: $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$

30. Solve the following Linear Programming Problem graphically:

Minimize Z = 13x – 15y subject to the constraints $x + y \le 7$, $2x - 3y + 6 \ge 0$, $x \ge 0$ and $y \ge 0$.

31. Evaluate: $\int e^x \frac{(1-\sin x)}{(1-\cos x)} dx$

SECTION – D

Questions 32 to 35 carry 5 marks each.

32. (A) Show that each of the relation R in the set A = {x ∈ Z : 0 ≤ x ≤ 12}, given by R = {(a, b) :|a – b| is a multiple of 4} is an equivalence relation.

Find the set of all elements related to 1 in each case.

OR

(B) Let A = R – {2} and B = R – {1}. If f : A → B is a function defined by $f(x) = \frac{x-1}{x-2}$, then show that f is one-one and onto.

33. (A) Find the shortest distance between the lines $\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{r} = 5\hat{i} - 2\hat{j} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$. If the lines intersect find their point of intersection.

OR

(B) Find the vector equation of the line passing through (1, 2, – 4) and perpendicular to the two lines:

$\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

34. Using integration, find the area of ΔABC, whose vertices are A(2, 0), B(4, 5) and C(6, 3).

35. If A = $\begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1} and hence solve the system of linear equations: 2x – 3y + 5z =11, 3x+ 2y–4z=–5, x + y – 2z = –3.

<u>SECTION – E(Case Study Based Questions)</u>

Questions 36 to 38 carry 4(1+1+2) marks each.

36. Case-Study 1: Polio drops are delivered to 50K children in a district. The rate at which polio drops are given is directly proportional to the number of children who have not been administered the drops. By the end of 2nd week half the children have been given the polio drops. How many will have been given the drops by the end of 3rd week can be estimated using the solution to the differential equation $\frac{dy}{dx} = k(50 - y)$ where x denotes the number of weeks and y the number of children who have been given the drops.

(i) State the degree of the above given differential Equation

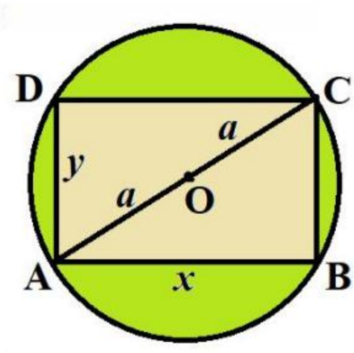
(ii) How arbitrary constants do the general solution of the above differential equation has?

(iii) Given that y(0) = 0 and k = 0.049 find the particular solution of the differential equation.

OR

(iii) Find the equation which gives the number of children who have been given polio drop up till week x.

37. Case-Study 2: A gardener wants to construct a rectangular bed of garden in a circular patch of land. He takes the maximum perimeter of the rectangular region as possible. (Refer to the images given below for calculations)



(i) Find the perimeter of rectangle in terms of any one side and radius of circle.

(ii) Find critical points to maximize the perimeter of rectangle?

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(iii) Check for maximum or minimum value of perimeter at critical point.

OR

(iii) If a rectangle of the maximum perimeter which can be inscribed in a circle of radius 10 cm is square, then the perimeter of region

38. Case-Study 3: In a test, you either guess or copies or knows the answer to a multiple-choice question with four choice. The probability that you make a guess is 1/3, you copy the answer is 1/6. The probability that your answer is correct, given that you guess it, is 1/8. And also, the probability that you answer is correct, given that you copy it, is 1/4.

Based on the above information, answer the following questions.

(i) The probability that you know the answer.

(ii) Find the probability that your answer is correct given that you guess it and the probability that your answer is correct given that you know the answer.

(iii) Find the probability that you know the answer given that you correctly answered it.

OR

(iii) Find the total probability of correctly answered the question.