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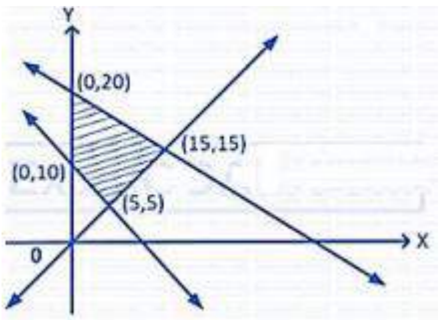
Pre Board-I Examination (2025-26)

Class : XII | **Subject : Mathematics** | **Set - 1**
Time : 3 HRS | **Maximum Marks : 80**

General Instructions:

- **The question paper is divided into 5 sections.**
- **Section A, consists of 20question. Qs. 19,20 are Assertion-Reason type Question. Each question carries 1 mark.**
- **Section B, consists of 5 questions (Very short Answer type Questions). Each question carries 2 marks.**
- **Section C, consists of 6 questions (Short Answer type Questions). Each question carries 3 marks.**
- **Section D, consists of 4 questions (Long Answer type Questions). Each question carries 5 marks.**
- **Section E, consists of 3 questions. Each question carries 4 marks.**

Q. No.	Section – A	Marks
1.	A function f: R→ A defined as f(x)=x^2 + 1 is onto, if A is (A) $(-\infty, \infty)$ (B) $(1, \infty)$ (C) $[1,\infty)$ (D)$[-1,\infty)$	1
2.	The set of points where the function $f(x) = \|3x - 2\|$ is differentiable, is A) R B) R- $\frac{3}{2}$ C) R- $\frac{2}{3}$ D) None	1
3.	*The* order and degree of the following differential equation $\frac{d^4y}{dx^4} + 2e^{\frac{dy}{dx}} + y^2 = 0$ A) 4, 1 (*b*) 4, Not defined (c) 1, 1 (*d*) None	1
4.	The value of $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$ A) 1 (B) 0 (C) -1 (D)2	1
5.	Let A be a square matrix of order 2 × 2, then $\|KA\|$ is equal to A) $K\|A\|$ B) $K^2\|A\|$ C) $K^3\|A\|$ D) $2K\|A\|$	1
6.	A line makes angles α, β, γ with the co-ordinate axes. If $\alpha + \beta = 90°$ then $\gamma =$ A) $0°$ B) $90°$ C) $180°$ D) None	1
7.	The feasible region of an LPP is shown in the figure. If Z= 3x + 9y, then the minimum value of Z occurs at  A) (0, 20) B) (0, 10) C) (5, 5) D) (15, 15)	1
8.	A and B are symmetric matrices of same order, then AB'-BA' is always A) symmetric B) skew- symmetric C) Zero matrix D) Identity matrix	1

9.	The area enclosed by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is A) $\pi^2 ab$ B) πab C) (2, ∞) $\pi a^2 b$ D) $\pi b^2 a$	1
10.	The interval in which $y = x^2 e^{-x}$ increasing if A) $(-\infty, \infty)$ B) (-2, 0) C) (2, ∞) D)) $(0, 2)$	1
11.	The point of intersection of lines $\frac{x-4}{5}=\frac{y-1}{2}=\frac{z}{1}$ and $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ A) (-1, -1, -1) B) (-1, -1,1) C) (1, -1, -1) D) (-1,1,-1)	1
12.	For any two events A and B, P(A)=4/5 and P(A∩B)=7/10, then $P(B/A)$ is A) 1/10 B) 1/8 C) 17/20 D) 7/8	1
13.	A is a square matrix of order 3 such that $\|adj\ A\| = 64$, then value of $\|A\|$ A) 64 B) 8 C) -8 D) ± 8	1
14.	Which of the following statement is correct A) every LPP admits an optimal solution B) If a L.P.P admits two optimal solutions it has an infinite number of optimal solutions C) A L.P.P admits unique optimal solution D) (0,0) is the only optimal solution.	1
15.	If $\|\vec{a}\| = 8, \|\vec{b}\| = 3$ and $\|\vec{a} \cdot \vec{b}\| = 12\sqrt{3}$ then the value of $\|\vec{a} \times \vec{b}\|$ is A) 12 B) $12\sqrt{3}$ C) 6 D) $4\sqrt{3}$	1
16.	If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then A^{10} is a) 10A B) 9A C) $2^9 A$ D)) $2^{10} A$	1
17.	$\int_{-1}^{1} \frac{\|x\|}{x}\, dx =, (x \neq 0)$ A) -1 B) 0 C) 1 D) 1	1
18.	$\tan^{-1}\sqrt{3} - \sec^{-1}(-2) =$ A) $\frac{\pi}{6}$ B) - $\frac{\pi}{6}$ C) -$\frac{\pi}{3}$ D) 0	1
19 & 20	Assertion-and-Reason Type Each question consists of two statements,namely,Assertion (A) and Reason (R).For selecting the correct answer,use the following code: (a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A). (c) Assertion (A) is true and Reason (R) is false. (d) Assertion (A) is false and Reason (R) is true.	
19	Assertion- If a matrix is skew symmetric then diagonal elements are zero. Reason- A matrix is skew symmetric if , $A^T = -A$	1

20	Assertion: If y=A sin x+ B cos x then $\frac{d^2y}{dx^2}$ + y=0 Reason: $\frac{d^2y}{dx^2} = \frac{d(dy)}{dx(dx)}$	1
Q. No	**Section – B**	**Marks**
21.	Find $\frac{dy}{dx}$ at $\frac{2\pi}{3}$ when $x = 10(t - \sin t)$ and $y = 12(1 - \cos t)$. OR Differentiate $\log(x + \sqrt{a^2 + x^2})$ with respect to x	2
22.	Find simplest form of $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$	2
23.	Find the intervals in which $y = [x(x-2)]^2$ is (a) increasing function (b) decreasing function.	2
24.	The value of $\int \sqrt{1 + \sin 2x}\, dx$.	2
25.	If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are 3 vectors with magnitudes 3,4 and 5 respectively and $\vec{a} + \vec{b} + \vec{c} = 0$ ρ find $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$ OR If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$ then find the value of λ	2
Q. No .	**Section – C**	**Marks**
26.	If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ and $x \neq y$, prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$ OR If $\sin y = x \sin(a + y)$, prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$	3
27.	Find the following integral $\int \frac{1 - \sin 2x}{x + \cos^2 x} dx$	3
28.	Solve the differential equation $e^x \tan y\, dx + (1 - e^x) \sec^2 y\, dy = 0$ OR Solve the differential equation $$\frac{dy}{dx} + y\sec^2 x = \sec^2 x \tan x$$	3
29.	Solve the following problem graphically: Minimise $Z = 20x + 10y$ subject to the constraints: $x+2y \le 40$, $3x + y \ge 30$, $4x + 3y \ge 60$ $x \ge 0$, $y \ge 0$	3
30.	Find the unit vector perpendicular to vector $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$	3
31	Given two independent events A and B such that P(A) = 0.3, P(B) = 0.6. Find (i) P(A and B) (ii) P(A and not B) (iii) P(A or B) (iv) P(neither A nor B)	3

	OR Probability of solving specific problem independently by A and B are 1/2 and 1/3 respectively. If both try to solve the problem independently, find the probability that (i) the problem is solved (ii) exactly one of them solves the problem	
	Section – D	
32.	Find the shortest distance between the following pair of lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ OR Find the foot of perpendicular and perpendicular distance of the point (1, 2, 1) with respect to the line $\frac{x-3}{1} = \frac{y+1}{2} = \frac{z-1}{3}$.	5
33.	Use the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ to solve the system of equations:-	5
34.	Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	5
35.	Find $\int \frac{x^2+1}{(x-1)^2(x+3)}\,dx$ OR Evaluate $\int_0^{\pi/2} \frac{dx}{a^2\cos^2 x + b^2 \sin^2 x}$	5
	Section – E	
36	In a rice mill husk is being poured in the shape of a cone so that the height of the cone is always one third the base diameter of the cone. Using the above information answer the following  (i) Find the rate of change in the base area when the amount of husk poured at the rate 100 cc per minute and radius of the base is 5 cm. (ii) Find the rate of change in the volume of the cone when the height is 7cm and increasing at the rate 4 11 cm/min	(2+2)
37.	Students of a school are taken to a railway museum to learn about railways heritage and its history.	1+1+2

An exhibit in the museum depicted many rail lines on the track near the railway station. Let L be the set of all rail lines on the railway track and R be the relation on L defined by $R = \{(l_1, l_2): l_1 \, is \; parallel \; to \; l_2\}$. On the basis of the above information answer the following questions:

(i) Find whether the relation R is symmetric or not.

(ii) Find whether the relation R is transitive or not.

(iii) If one of the rail lines on the railway track is represented by the equation y=3x+2, then find the set of rail lines in R related to it.

OR

Let S be the relation defined by $S = \{(l_1, l_2): l_1 \, is \; perpendicular \; to \; l_2\}$. Check whether the relation S is symmetric and transitive.

38. A doctor is to visit a patient. From the past experience, it is known that the probabilities that he will come by cab, metro, bike or by other means of transport are respectively 3/10, 1/5, 1/10 and 2/5. The probabilities that he will be late are 1/4, 1/3, 1/12 and 1/10 if he comes by cab, metro, bike and other means of transport respectively. 2 + 2

(a) What is the probability that the doctor arrived late?

(b) When the doctor arrives late, what is the probability that he comes by metro?

OR

(b) When the doctor arrives late, what is the probability that he comes by cab?