

SAMPLE QUESTION PAPER

BLUE PRINT

Time Allowed : 2 hours

Maximum Marks : 40

S. No.	Unit / Chapter		Section-A (2 marks)	Section-B (3 marks)	Section-C (4 marks)	Total
1.	Unit-III	Integrals	1(2)	1(3)	–	7(18)
2.		Application of Integrals	1(2)	1(3)*	–	
3.		Differential Equations	2(4)	–	1(4)	
4.	Unit-IV	Vector Algebra	–	1(3)	1(4)*	4(14)
5.		Three Dimensional Geometry	–	1(3)*	1(4)	
6.	Unit-VI	Probability	2(4) [#]	–	1(4)	3(8)
		Total Questions	6(12)	4(12)	4(16)	14(40)

*It is a choice based question.

[#]Out of the two or more questions only one question is choice based.

MATHEMATICS

Time Allowed : 2 hours

Maximum Marks : 40

General Instructions :

1. This question paper contains three sections - A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section - B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q14 is a case-based problem having 2 sub parts of 2 marks each.

SECTION - A

1. Find the integrating factor of the differential equation $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right)dx = dy$.
2. If A and B are two events associated with the same random experiment such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$ and $P(\bar{A}) = \frac{2}{3}$, then find $P(B)$.
3. Find : $\int_{-\frac{\pi}{4}}^0 \frac{1 + \tan x}{1 - \tan x} dx$
4. If $P(A) = \frac{2}{5}$, $P(B) = \frac{3}{10}$ and $P(A \cap B) = \frac{1}{5}$, then find the value of $P(A' | B')$.

OR

Let A and B be independent events with $P(A) = 1/4$ and $P(A \cup B) = 2P(B) - P(A)$. Find $P(B)$.

5. Find the order and the degree of the differential equation $x^2 \frac{d^2 y}{dx^2} = \left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^4$.
6. Find the area of the ellipse $\frac{x^2}{4^2} + \frac{y^2}{9^2} = 1$.

SECTION - B

7. Evaluate : $\int \frac{5x+3}{\sqrt{x^2+4x+10}} dx$
8. Find a unit vector perpendicular to both of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$.
9. Find the direction cosines of the line $\frac{x+2}{2} = \frac{2y-7}{6} = \frac{5-z}{6}$. Also, find the vector equation of the line through the point A(-1, 2, 3) and parallel to the given line.

OR

Find the equation of the plane passing through the points $(-1, 2, 0)$, $(2, 2, -1)$ and parallel to the line

$$\frac{x-1}{1} = \frac{2y+1}{2} = \frac{z+1}{-1}.$$

10. Find the area of the region bounded by the curve $x = 2y + 3$ and the lines $y = 1$ and $y = -1$.

OR

If the area bounded the curve $y^2 = 16x$ and line $y = mx$ is $\frac{2}{3}$, then find the value of m .

SECTION - C

11. Assume that the chances of a patient having a heart attack is 40%. Assuming that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drug reduces its chance by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options, the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga.
12. If $\vec{a} = 3\hat{i} - \hat{j}$ and $\vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$ then express \vec{b} in the form $\vec{b} = \vec{b}_1 + \vec{b}_2$ where $\vec{b}_1 \parallel \vec{a}$ and $\vec{b}_2 \perp \vec{a}$.

OR

If $\hat{i} + \hat{j} + \hat{k}$, $2\hat{i} + 5\hat{j}$, $3\hat{i} + 2\hat{j} - 3\hat{k}$ and $\hat{i} - 6\hat{j} - \hat{k}$ respectively are the position vectors of points A, B, C and D, then find the angle between the straight lines AB and CD. Find whether \overline{AB} and \overline{CD} are collinear or not.

13. Find the coordinates of the foot of perpendicular and the length of the perpendicular drawn from the point $P(5, 4, 2)$ to the line, $\vec{r} = -\hat{i} + 3\hat{j} + \hat{k} + \lambda(2\hat{i} + 3\hat{j} - \hat{k})$. Also find the image of P in this line.

CASE-BASED/DATA-BASED

14. If the equation is of the form $\frac{dy}{dx} = \frac{f(x, y)}{g(x, y)}$ or $\frac{dy}{dx} = F\left(\frac{y}{x}\right)$, where $f(x, y)$, $g(x, y)$ are homogeneous functions of the same degree in x and y , then put $y = vx$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$, so that the dependent variable y is changed to another variable v and then apply variable separable method.

Based on the above information, answer the following questions.

- (i) Find the general solution of $x^2 \frac{dy}{dx} = x^2 + xy + y^2$.
- (ii) Find the solution of the differential equation $2xy \frac{dy}{dx} = x^2 + 3y^2$.