

# TERM-II

# 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)*	1(4)	6(18)
2.		Application of Integrals	–	–	1(4)	
3.		Differential Equations	1(2)*	1(3)	–	
4.	Unit-IV	Vector Algebra	–	1(3)	–	5(14)
5.		Three Dimensional Geometry	2(4)	1(3)*	1(4)	
6.	Unit-VI	Probability	2(4)	–	1(4)*	3(8)
	<b>Total Questions</b>		<b>6(12)</b>	<b>4(12)</b>	<b>4(16)</b>	<b>14(40)</b>

\*It is a choice based question.

# 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. Integrate the function  $\frac{\cos(x+a)}{\sin(x+b)}$  with respect to  $x$ .
2. Write the sum of the order and degree of the following differential equation

$$1 + \left(\frac{dy}{dx}\right)^4 = 7 \left(\frac{d^2y}{dx^2}\right)^3.$$

OR

Find the integrating factor of the differential equation  $x \frac{dy}{dx} + 2y = x^2$ .

3. If a unit vector  $\vec{a}$  makes angles  $\frac{\pi}{3}$  with  $\hat{i}$ ,  $\frac{\pi}{4}$  with  $\hat{j}$  and an acute angle  $\theta$  with  $\hat{k}$ , then find the value of  $\theta$ .
4. Three events  $A$ ,  $B$  and  $C$  have probabilities  $\frac{2}{5}$ ,  $\frac{1}{3}$  and  $\frac{1}{2}$  respectively. Given that  $P(A \cap C) = \frac{1}{5}$  and  $P(B \cap C) = \frac{1}{4}$ , find the value of  $P(C/B)$  and  $P(\bar{A} \cap \bar{C})$ .
5. The equation of a line is  $5x - 3 = 15y + 7 = 3 - 10z$ . Write the direction cosines of the line.
6. A university has to select an examiner from a list of 50 persons, 20 of them are women and 30 men, 10 of them knowing Hindi and 40 not, 15 of them being teachers and the remaining 35 not. What is the probability of the university selecting a Hindi knowing woman teacher?

## SECTION - B

7. Find :  $\int \frac{x}{(x-1)^2(x+2)} dx$

OR

Evaluate :  $\int \sin x \sin 2x \sin 3x dx$

8. Find the particular solution of the differential equation  $\frac{dy}{dx} + 2y \tan x = \sin x$ , given that  $y = 0$  when  $x = \frac{\pi}{3}$ .

9. Show that the vectors  $2\hat{i} - \hat{j} + \hat{k}$ ,  $3\hat{i} + 7\hat{j} + \hat{k}$  and  $5\hat{i} + 6\hat{j} + 2\hat{k}$  form the sides of a right-angled triangle.
10. Find the perpendicular distance of the point (1, 0, 0) from the line  $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ . Also find the coordinates of the foot of the perpendicular and the equation of the perpendicular.

OR

A plane makes intercepts -6, 3, 4 respectively on the coordinate axes. Find the length of the perpendicular from the origin on it.

### SECTION - C

11. Find the area of the smaller region bounded by the ellipse  $\frac{x^2}{9} + \frac{y^2}{4} = 1$  and the line  $\frac{x}{3} + \frac{y}{2} = 1$ .
12. Find the distance of the point (2, 12, 5) from the point of intersection of the line  $\vec{r} = 2\hat{i} - 4\hat{j} + 2\hat{k} + \lambda(3\hat{i} + 4\hat{j} + 2\hat{k})$  and the plane  $\vec{r} \cdot (\hat{i} - 2\hat{j} + \hat{k}) = 0$ .
13. A bag contains 4 balls. Two balls are drawn at random (without replacement) and are found to be white. What is the probability that all balls in the bag are white?

OR

A shopkeeper sells three types of seeds  $A_1$ ,  $A_2$  and  $A_3$ . They are sold as a mixture where the proportions are 4 : 4 : 2 respectively. The germination rates of three types of seeds are 45%, 60% and 35%.

Calculate the probability

- (a) that it will not germinate given that the seed is of type  $A_3$ .
- (b) of a randomly chosen seed to germinate.
- (c) that it is of type  $A_2$  given that a randomly chosen seed does not germinate.

### CASE-BASED/DATA-BASED

14. When the integrand can be expressed as a product of two functions, one of which can be differentiated and the other can be integrated, then we apply integration by parts.

If  $f(x)$  = first function (that can be differentiated) and  $g(x)$  = second function (that can be integrated), then the preference of this order can be decided by the word "ILATE", where

$I$  stands for Inverse Trigonometric Function

$L$  stands for Logarithmic Function

$A$  stands for Algebraic Function

$T$  stands for Trigonometric Function

$E$  stands for Exponential Function, then

$$\int f(x)g(x)dx = f(x)\int g(x)dx - \int \left\{ \frac{d}{dx} f(x) \int g(x)dx \right\} dx$$

Based on the given information, answer the following questions.

(i) Evaluate :  $\int x \sin 3x dx$ .

(ii) Evaluate :  $\int \log(x+1) dx$ .