



### General Instructions :

Read the following instructions very carefully and strictly follow them :

- (i) This question paper contains **three** sections – **Section A, B and C.**
- (ii) Each section is **compulsory.**
- (iii) **Section A** has **6** short answer type I questions of **2** marks each.
- (iv) **Section B** has **4** short answer type II questions of **3** marks each.
- (v) **Section C** has **4** long answer type questions of **4** marks each.
- (vi) There is an internal choice in some questions.
- (vii) Question no. **14** is a case-study based question with 2 sub-parts of **2** marks each.

### SECTION A

Questions number **1** to **6** carry **2** marks each.

1. The foot of a perpendicular drawn from the point  $(-2, -1, -3)$  on a plane is  $(1, -3, 3)$ . Find the equation of the plane. 2

2. A coin is tossed twice. The following table shows the probability distribution of number of tails :

X	0	1	2
P(X)	K	6K	9K

- (a) Find the value of K.
- (b) Is the coin tossed biased or unbiased? Justify your answer. 2

3. (a) If  $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 400$  and  $|\vec{b}| = 5$ , then find the value of  $|\vec{a}|$ . 2

**OR**

- (b) Find all the possible vectors of magnitude  $5\sqrt{3}$  which are equally inclined to the coordinate axes. 2
4. Find the general solution of the differential equation 2
- $$\sec^2 x \cdot \tan y \, dx + \sec^2 y \cdot \tan x \, dy = 0.$$

5.

Evaluate :

$$\int_0^1 x^2 e^x dx$$

2

6.

There are two bags. Bag I contains 1 red and 3 white balls, and Bag II contains 3 red and 5 white balls. A bag is selected at random and a ball is drawn from it. Find the probability that the ball so drawn is red in colour.

2

### SECTION B

Questions number 7 to 10 carry 3 marks each.

7.

Using integration, find the area of the region  $((x, y) : y^2 \leq x \leq y)$ .

3

8.

(a) If a line makes  $60^\circ$  and  $45^\circ$  angles with the positive directions of x-axis and z-axis respectively, then find the angle that it makes with the positive direction of y-axis. Hence, write the direction cosines of the line.

3

OR

(b) Check whether the lines  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$  and  $\frac{x-4}{5} = \frac{y-1}{2} = z$  are skew or not.

3

9.

(a) Find :

$$\int \frac{1}{e^x + 1} dx$$

3

OR

(b) Evaluate :

$$\int_1^4 \{ |x| + |3-x| \} dx$$

3

10.

If  $\vec{a}$  and  $\vec{b}$  are two vectors of equal magnitude and  $\alpha$  is the angle between them, then prove that  $\frac{|\vec{a} + \vec{b}|}{|\vec{a} - \vec{b}|} = \cot \left( \frac{\alpha}{2} \right)$ .

3



### SECTION C

Questions number 11 to 14 carry 4 marks each.

11. (a) Find the particular solution of the differential equation  

$$x \frac{dy}{dx} + y + \frac{1}{1+x^2} = 0, \text{ given that } y(1) = 0.$$

4

OR

- (b) Find the general solution of the differential equation  

$$x(y^3 + x^3) dy = (2y^4 + 5x^3y) dx.$$

4

12. Evaluate :

4

$$\int_0^{\pi} \frac{x}{9 \sin^2 x + 16 \cos^2 x} dx$$

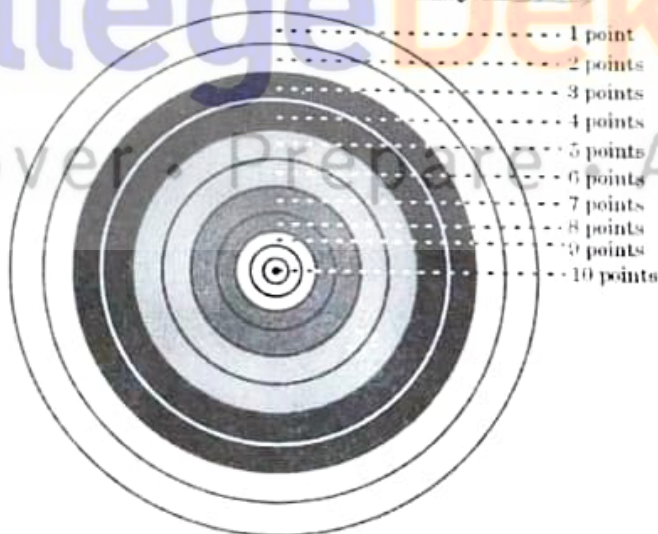
13. Find the equations of the planes passing through the line of intersection of the planes  $\vec{r} \cdot (\hat{i} + 3\hat{j}) = 6$  and  $\vec{r} \cdot (3\hat{i} - \hat{j} - 4\hat{k}) = 0$ , which are at a distance of 1 unit from the origin.

4

### Case-Study Based Question

14. In a game of Archery, each ring of the Archery target is valued. The centremost ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards.

Archer A is likely to earn 10 points with a probability of 0.8 and Archer B is likely to earn 10 points with a probability of 0.9.



Based on the above information, answer the following questions :

If both of them hit the Archery target, then find the probability that

- (a) exactly one of them earns 10 points.  
 (b) both of them earn 10 points.

2

2