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	2(4)	1(3)*	–	7(18)
2.		Application of Integrals	1(2)	1(3)	–	
3.		Differential Equations	1(2)*	–	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.

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. Determine the order and degree, if defined of the given differential equation $x\left(\dfrac{d^3y}{dx^3}\right)^2 + \left(\dfrac{dy}{dx}\right)^4 + y^2 = 0$

OR

Solve the differential equation $5\dfrac{dy}{dx} = e^x y^4$

2. If A and B are two independent events such that $P(A \cup B) = 0.6$ and $P(A) = 0.2$, then find $P(B)$.

3. A class consists of 80 students; 25 of them are girls and 55 boys; 10 of them are rich and the remaining poor; 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl?

4. Evaluate : $\displaystyle\int \dfrac{dx}{\sqrt{2+4x-x^2}}$

5. Evaluate : $\displaystyle\int_{1}^{2}\left[\dfrac{1}{x} - \dfrac{1}{2x^2}\right]e^{2x}dx.$

6. Find the area of the triangle formed by the straight lines $y = 2x$, $x = 0$ and $y = 2$ by integration.

SECTION - B

7. Evaluate : $\displaystyle\int \dfrac{\cos x}{\sin^2 x + 4\sin x + 5}dx$

OR

Evaluate : $\displaystyle\int \sqrt{\dfrac{a-x}{a+x}}dx$

8. Let $\vec{a}, \vec{b}, \vec{c}$ be unit vectors such that $\vec{a}\cdot\vec{b} = \vec{a}\cdot\vec{c} = 0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\dfrac{\pi}{6}$, prove that $\vec{a} = \pm 2(\vec{b}\times\vec{c}).$

Mathematics

Let $\vec{a} = 5\hat{i} - \hat{j} + 7\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \lambda\hat{k}$. Find λ, such that $\vec{a} + \vec{b}$ is orthogonal to $\vec{a} - \vec{b}$.

9. Find the equation of a plane through the intersection of the planes $\vec{r} \cdot (\hat{i} + 3\hat{j} - \hat{k}) = 5$ and $\vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 3$ and passing through the point $(2, 1, -2)$.

10. Draw the region lying in first quadrant and bounded by $y = 9x^2$, $x = 0$, $y = 1$ and $y = 4$. Also, find the area of region using integration.

SECTION - C

11. A company has two plants to manufacture bicycles. The first plant manufactures 60% of the bicycles and the second plant, 40%. Also, 80% of the bicycles are rated of standard quality at the first plant and 90% of standard quality at the second plant. A bicycle is picked up at random and found to be of standard quality. Find the probability that it comes from the second plant.

12. If $\vec{a} = 4\hat{i} + 5\hat{j} - \hat{k}$, $\vec{b} = \hat{i} - 4\hat{j} + 5\hat{k}$, $\vec{c} = 3\hat{i} + \hat{j} - \hat{k}$, then find a vector $\vec{d}$ which is perpendicular to both and $\vec{c} \cdot \vec{d} = 21$.

13. Find the equation of the plane through the points $(1, 0, -1)$, $(3, 2, 2)$ and parallel to the line
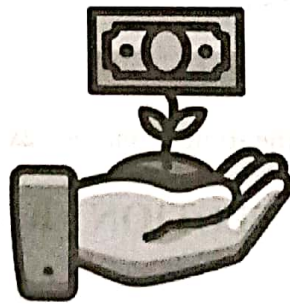$$\frac{x-1}{1} = \frac{y-1}{-2} = \frac{z-2}{3}.$$

OR

Find the shortest distance between the lines
$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$

CASE-BASED/DATA-BASED

14. It is known that, if the interest is compounded continuously, the principal changes at the rate equal to the product of the rate of bank interest per annum and the principal. Let P denotes the principal at any time t and rate of interest be r % per annum.

Based on the above information, answer the following questions.

(i) If P_0 be the initial principal, then find the solution of differential equation formed in given situation.

(ii) If the interest is compounded continuously at 5% per annum, in how many years will ₹ 100 double itself?