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)	–	–	7(18)
2.		Application of Integrals	1(2)	–	1(4)	
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	1(2)	2(6)#	–	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.

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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 $\int \frac{10x^9 + 10^x \log_e 10}{10^x + x^{10}} dx$.

2. Show that $y = be^x + ce^{2x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$.

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

4. Evaluate : $\int (2\tan x - 3\cot x)^2 dx$

5. Determine the order and degree respectively, if defined, of the following differential equations.

$$5x\left(\frac{dy}{dx}\right)^2 - \frac{d^2y}{dx^2} - 6y = \log x.$$

OR

Write the integrating factor of the differential equation $\frac{dy}{dx} + y\tan x - \sec x = 0$.

6. A problem in mathematics is given to 3 students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. What is the probability that the problem is solved ?

SECTION - B

7. A bag contains 5 white, 7 red and 8 black balls. If four balls are drawn one by one without replacement, then find the probability of getting all white balls.

8. Find the shortest distance between the lines l_1 and l_2 whose vector equations are $\vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$.

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OR

Find the equation of the plane passing through the line of intersection of the planes $2x + y - z = 3$, $5x - 3y + 4z + 9 = 0$ and parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$.

9. If $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$, then find $P(\bar{A} \mid \bar{B})$ and $P(\bar{B} \mid \bar{A})$.

OR

Two dice are rolled. Let A, B, C be the events of getting a sum of 2, a sum of 3 and a sum of 4 respectively. Then, show that

(i) A is a simple event

(ii) B and C are compound events

(iii) A and B are mutually exclusive events.

10. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ having the same length $\sqrt{2}$ and their scalar product is -1.

SECTION - C

11. Find the value of p for which the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are

(i) perpendicular (ii) parallel

OR

Define $\vec{a} \times \vec{b}$ and prove that $|\vec{a} \times \vec{b}| = (\vec{a} \cdot \vec{b}) \tan\theta$, where θ is angle between $\vec{a}$ and $\vec{b}$.

12. Find the area of triangle whose two vertices formed from the x-axis and line $y = 3 - |x|$.

13. Find the distance of the point (3, 4, 5) from the plane $x + y + z = 2$ measured parallel to the line $2x = y = z$.

CASE-BASED/DATA-BASED

14. If an equation is of the form $\frac{dy}{dx} + Py = Q$, where P, Q are functions of x, then such equation is known as linear differential equation. Its solution is given by $y \cdot (\text{I.F.}) = \int Q \cdot (\text{I.F.})\, dx + c$, where I.F. $= e^{\int P dx}$.

Now, suppose the given equation is $(1 + \sin x)\frac{dy}{dx} + y \cos x + x = 0$.

Based on the above information, answer the following questions.

(i) Find the value of I.F..

(ii) Find the solution of the given differential equation.

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