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**MATHS-III**

**QUESTION WISE**  
**QUESTION BANK**

**Subject : Maths – III (G-Scheme)**

**Question : 1**

This question contains 12 questions from all chapters, of 2 marks each

Q1] Solve any Ten .

[ 20 Marks ]

- a] Application of derivatives
- b] Application of derivatives
- c] Integration
- d] Integration
- e] Integration
- f] Integration
- g] Integration
- h] Application of integration
- i] Differential equation {order and degree}
- j] Differential equation
- k] Probability {simple}
- l] Probability {probability distribution}

**Types of Problems**

No.	Type of Problem	Q.B.Checked	Revision
1	Problems on slope of curve		[ ] [ ] [ ] [ ] [ ]
2	To find the radius of curvature		[ ] [ ] [ ] [ ] [ ]
3	Integration of $\int ax + b dx$		[ ] [ ] [ ] [ ] [ ]
4	Integration by partial fractions		[ ] [ ] [ ] [ ] [ ]
5	Integration of $\int \frac{dx}{x^2+a^2}$		[ ] [ ] [ ] [ ] [ ]
6	Integration by substitution		[ ] [ ] [ ] [ ] [ ]
7	Integration by trig. transformation.		[ ] [ ] [ ] [ ] [ ]
8	Integration by parts		[ ] [ ] [ ] [ ] [ ]
9	Area under a curve		[ ] [ ] [ ] [ ] [ ]
10	To find order and degree of Differential equation		[ ] [ ] [ ] [ ] [ ]
11	Verify the solution of differential equation		[ ] [ ] [ ] [ ] [ ]
12	Problem on simple probability		[ ] [ ] [ ] [ ] [ ]
13	Problem on probability distribution		[ ] [ ] [ ] [ ] [ ]

### **TYPE 1 :Problems on slope of curve**

- 1) Find the slope of curve  $y = 3x - x^2$  at (4,-4)
- 2) Find the slope of curve  $y = x^2 - 4x + 2$  at (7,23)
- 3) Find the slope of curve  $y = x^3 - 24x + 2$  at point (3,-43)
- 4) Find the point on the curve  $y = 3x - x^2$  where the slope is 5.
- 5) Find the point on the curve  $y = x^3 - 24x + 2$  where the slope is 3.
- 6) Find the point on the curve  $y = \sqrt{x}$  where the slope is  $\frac{1}{6}$ .
- 7) At what point on the curve  $y = e^x$ , the slope is unity .
- 8) Find the point on the curve  $y = \sqrt{x^3}$  at  $x=4$ .
- 9) Find the slope of the curve  $x^2 + y^2 = 25$  at (-3,4).
- 10) Find the point on the curve  $y = 7x - 3x^2$  where the inclination to the tangent is  $45^\circ$ .

### **TYPE 2:To find the radius of curvature**

- 1) Find the radius of curvature of the curve  $y = x^3 + 3x^2 + 2$  at (1,2)
- 2) Find the radius of curvature of curve  $y = 2x^3$  at (2,8)
- 3) Find the radius of curvature of curve  $y = x^2$  at  $x = 1/2$
- 4) Find the radius of curvature of the curve  $y = \log(\sin x)$  at  $x = \pi/2$ .
- 5) Find the radius of curvature of the curve  $y^2 = 4x$  at  $(2, 2\sqrt{2})$
- 6) Find the radius of curvature of the curve  $y = 2x^3 - x + 3$  at  $x = 1$
- 7) Find the radius of curvature of the curve  $y = x^3$  at (2,8)

### TYPE 3: Integration of $\int ax + b dx$

1)  $\int_2^{11} \frac{dx}{3x-2}$

2)  $\int_0^2 \frac{dx}{4x-5}$

3)  $\int_2^3 \frac{dx}{x+1}$

4)  $\int_2^{11} \frac{dx}{2x+11}$

5)  $\int_0^1 \frac{dx}{x-7}$

6)  $\int_0^1 \frac{dx}{4x+9}$

7)  $\int \sqrt{2x+7} dx$

8)  $\int \sqrt[3]{4x+7} dx$

9)  $\int \sqrt[3]{2x-9} dx$

10)  $\int \frac{1}{\sqrt{4x+5}} dx$

11)  $\int \frac{dx}{\sqrt[3]{4x+5}}$

### Answers:

1)  $\frac{1}{3} \log(31/4)$

2)  $\frac{1}{4} \log(3/-5)$

3)  $\log(4/3)$

4)  $\frac{1}{2} \log(11/5)$

5)  $\log(6/7)$

6)  $\frac{1}{4} \log(13/9)$

7)  $\frac{1}{3} (2x+7)^{3/2} + c$

8)  $\frac{3}{16} (4x+7)^{4/3} + c$

9)  $\frac{3}{8} (2x-9)^{4/3} + c$

10)  $\frac{1}{2} (4x+5)^{1/2} + c$

11)  $\frac{3}{8} (4x+5)^{1/3} + c$

### TYPE 4: Integration by partial fractions

1)  $\int \frac{1}{(x+1)(x+2)} dx$

2)  $\int \frac{x}{(x+1)(x-2)} dx$

3)  $\int \frac{x+1}{(x+2)(x+3)} dx$

4)  $\int \frac{x-4}{(x+1)(x+2)} dx$

5)  $\int \frac{dx}{(x-1)(x+2)}$

6)  $\int \frac{2x+3}{(x-1)(x+2)} dx$

7)  $\int \frac{1}{(x-1)(x-6)} dx$

8)  $\int \frac{1}{(x-8)(x+2)} dx$

9)  $\int \frac{x-7}{(x+1)(x+2)} dx$

10)  $\int \frac{2x-6}{(x+1)(x+2)} dx$

Ans:

**TYPE 5: Integration of  $\int \frac{dx}{x^2+a^2}$**

- 1)  $\int_{-1}^1 \frac{dx}{1+x^2}$       2)  $\int_0^1 \frac{dx}{32-8x^2}$       3)  $\int_0^1 \frac{dx}{x^2-36}$       4)  $\int_0^1 \frac{dx}{x^2+4}$   
5)  $\int \frac{dx}{x^2+12x+72}$       6)  $\int \frac{dx}{x^2-6x+13}$       7)  $\int \frac{dx}{x^2+4x+5}$       8)  $\int \frac{dx}{x^2+3x+2}$

**TYPE 6 :Integration by substitution**

- 1) Evaluate  $\int \frac{1}{x \cdot \log x} dx$       2) Evaluate  $\int 2x \cdot e^{x^2} dx$       3) Evaluate  $\int \frac{(2+\log x)^2}{x} dx$   
4) Evaluate  $\int \sin^3 x \cdot \cos x dx$       5) Evaluate  $\int e^{\tan x} \cdot \sec^2 x dx$   
6) Evaluate  $\int \frac{\sin(\sqrt{x})}{\sqrt{x}} dx$       7) Evaluate  $\int \frac{\sin^{-1} x}{\sqrt{1+x^2}} dx$   
8) Evaluate  $\int \frac{\operatorname{cosec}^2(\log x)}{x} dx$       9) Evaluate  $\int \frac{(\tan^{-1} x)^2}{1+x^2} dx$       10) Evaluate  $\int \frac{\sec^2(\log x)}{x} dx$

**TYPE 7 :Integration by trig. transformation**

- 1)  $\int \sqrt{1+\cos 2x} dx$       2)  $\int \sqrt{1-\cos 2x} dx$       3)  $\int \sqrt{1+\cos x} dx$   
4)  $\int \sqrt{1-\cos x} dx$       5)  $\int \frac{\sin^2 x}{1+\cos x} dx$       6)  $\int (\sin x + \cos x)^2 dx$   
7)  $\int \sin^2 x dx$       8)  $\int \tan^2 x dx$       9)  $\int \frac{1+\cos x}{1-\cos x} dx$   
10)  $\int \cos^2 \frac{x}{2} dx$       11)  $\int \sec^2 x dx$       12)  $\int (\sin x - \cos x)^2 dx$   
13)  $\int \operatorname{cosec}^2 x dx$       14)  $\int \frac{1}{\sin^2 x + \cos^2 x} dx$       15)  $\int \sin^{-1}(\cos x) dx$

**TYPE 8 :Integration by parts 2 marks**

- 1)  $\int \sin x \cdot x dx$       2)  $\int x \cdot \sec^2 x dx$       3)  $\int x \cdot \log x dx$       4)  $\int x \cdot e^x dx$   
5)  $\int x \cdot e^x dx$       6)  $\int x \cdot \cos x dx$       7)  $\int \log x dx$       8)  $\int \tan^{-1} x dx$   
9)  $\int \cot^{-1} x dx$

**TYPE 9 :Area under a curve 2 marks**

- 1) Find the area enclosed by the curve  $y = 3x^2$  and the line  $x = 1, x = 3$  and  $x$  axis.
- 2) Find the area under the curve  $y = x^2 + 2x + 2$  and the line  $x = 1, x = 0$  and  $x$  axis.
- 3) Find the area enclosed by the curve  $y = 2x + x^2$  and the line  $x = 1, x = 3$  and  $x$  axis.
- 4) Find the area enclosed by the curve  $y = x^3 - 2x + 4$  and the line  $x = 2, x = 3$  and  $x$  axis.
- 5) Find the area enclosed by the curve  $y = \sin x$  and the ordinates  $x = \pi/6$  and  $x = \pi/3$ .
- 6) Find the area enclosed by the curve  $y = 4 - x^2$  and the line  $x = -2, x = 2$  and  $x$  axis.
- 7) Find the area enclosed by the curve  $y = 3x(x - 2)$  and the line  $x = 0, x = 2$  and  $x$  axis.
- 8) Find the area enclosed by the curve  $y = 4 - x^2$  and  $x$  axis.
- 9) Find the area enclosed by the curve  $y = \sin x$  and the line  $x = 0, x = 2\pi$  and  $x$  axis.
- 10) Find the area enclosed by the curve  $y = \cos x$  and the line  $x = -\pi/4, x = \pi/4$  and  $x$  axis.

**TYPE 10 :To find order and degree of Differential equation**

Find order & degree of following D.E

$$1] x^2 \cdot \frac{d^2y}{dx^2} + x \cdot \left[ \frac{dy}{dx} \right]^3 = my$$

$$2] \frac{d^2y}{dx^2} = \sqrt{y + \left( \frac{dy}{dx} \right)^2}$$

$$3] y = x \cdot \frac{dy}{dx} + \frac{2}{dy/dx}$$

$$4] y \cdot \frac{d^2y}{dx^2} + x \cdot \frac{dy}{dx} = 0$$

$$5] \left( \frac{d^2y}{dx^2} \right)^3 + 3x \cdot \left( \frac{dy}{dx} \right)^4 = 0$$

$$6] \sqrt[3]{\frac{d^2y}{dx^2}} = \frac{dy}{dx}$$

$$7] 2 \cdot \frac{d^2y}{dx^2} + \left( \frac{dy}{dx} \right)^3 = 0$$

$$8] \left[ 1 + \left( \frac{dy}{dx} \right)^2 \right]^{3/2} = k \cdot \frac{d^2y}{dx^2}$$

$$9] \left[ k + \left( \frac{dy}{dx} \right)^2 \right]^{3/2} = \frac{d^3y}{dx^3}$$

$$10) \frac{d^3y}{dx^3} = \left[ k + \left( \frac{dy}{dx} \right)^2 \right]^{3/2}$$

### **TYPE 11 :Verify the solution of differential equation**

1] Verify that  $y = \log x$  is solution of

$$x \cdot \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$$

2] Verify that  $y = \cos x$  is solution of

$$\frac{d^2y}{dx^2} + y = 0$$

3] Show that  $y = ae^x + b.e^{-x}$  is solution of

$$\frac{d^2y}{dx^2} = y$$

4] Show that  $y = \sin(\log x)$  is a solution of

$$x^2 \cdot \frac{d^2y}{dx^2} + x \cdot \frac{dy}{dx} + y = 0$$

5] Show that  $y = e^x - e^{-x}$  is solution of

$$\frac{d^2y}{dx^2} - y = 0$$

### **TYPE 12 :Problem on simple probability**

1) Three fair coins are tossed simultaneously. Find the probability of getting at least two heads.

2) Two coins are tossed, find the probability of getting at least one head.

3) Two unbiased dice are thrown, find the probability that sum of scores will be, a) greater than 9, b) sum is prime number c) sum is even number.

4) In a single throw of two dice find the probability that  $P(\text{sum greater than } 8)$

5) From tickets marked 1 to 20. One ticket is drawn at random, find the probability that number on ticket is multiple of 3 or 5.

6) From a pack of 52 cards one card is drawn at random, find the probability of getting king.

7) One card is drawn from 52 well shuffled cards, find the probability that it will be a face card.

8) An urn contains 10 black and 10 white balls. Find the probability of drawing two balls of same colour..

9) What is the probability that a non-leap year should have fifty three sundays?

10) An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that none is red ball.

11) From a class of 12 students, 5 boys and rest are girls. Find the probability that a student selected is a girl.

12) Find the probability that if a card is drawn from an ordinary pack is diamond.

13) Two fair dice are thrown simultaneously, find the probability that the sum of scores is 12.

14) One card is drawn from a pack of 52 cards, find the probability that it is a face card.

### **TYPE13 :Problem on Probability distribution**

1) An unbiased coin is tossed 20 times. Find the probability of getting at least one head.

2) An unbiased coin is tossed 5 times. Find the probability of getting 3 heads.

3) An unbiased coin is tossed 6 times. Find the probability of getting 2 heads.

4) A cubic die is thrown 8 times find the probability that an ace {ONE} will be shown exactly two times.

5) A cubic die is thrown 4 times. What is the probability of obtaining at least one six.

6) A cubic die is thrown 4 times, find the probability of getting all odd numbers.

7) for a poisson's distribution  $p(3)=P(2)$  , Find the value of average  $m$  and  $P(4)$

8) If a random variable has a Poisson distribution such that  $p(2)=p(3)$  Find  $p(5)$ .