

Roll No.

Total Pages : 4

1001/MJ

F-7/2051

**INTEGRAL CALCULUS & DIFFERENTIAL
EQUATIONS**

Paper–CSM-121

Semester–II

Time allowed : 3 Hours] [Maximum Marks : 45

Note: The candidates are required to attempt two questions each from Section A and B carrying 6 marks each and the entire Section C consisting of 7 short answer type questions carrying 3 marks each.

SECTION-A

1. Integrate $\frac{x+1}{(x^2+4x+5)\sqrt{x+2}} dx$. 6

2. Find the whole length of the ellipse : 6
 $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$

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3. (a) Solve :

$$\frac{dy}{dx} = \frac{y^3 + 3x^2y}{x^3 + 3xy^2} \quad 3$$

(b) Solve the differential equation :

$$(\sin x + \cos x)dy + (\cos x - \sin x)dx = 0. \quad 3$$

4. (a) Solve the differential equation : 3

$$\frac{dy}{dx} = \frac{y}{2x} + \frac{x^2}{2y}.$$

(b) Find the area enclosed in a circle of radius r . 3

SECTION-B

5. Solve the differential equation :

$$x^2p^2 + 3x4p + 2y^2 = 0. \quad 6$$

6. Solve :

$$(D^2 - 2D + 4)y = e^x \cos x. \quad 6$$

7. Solve : 6

$$x^2 \frac{d^2y}{dx^2} - 2x(1+x) \frac{dy}{dx} + 2(1+x)y = x^3.$$

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8. Find the orthogonal trajectory of the cycloids :

$$x^{2/3} + y^{2/3} = a^{2/3}. \quad 6$$

SECTION-C

9. (i) Find the area bounded by the parabola $y^2 = 4ax$ and its Latus rectum. 3

(ii) Find the volume of the solid generated by revolving the ellipse :

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \text{ about x-axis.} \quad 3$$

(iii) Solve the following equations :

$$(4D^2 + 4D - 3)y = e^{2x}. \quad 3$$

(iv) Solve : 3

$$x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 3y = x^2.$$

(v) Show that the differential equation is exact

$$2x \sin 3y dx + 3x^2 \cos 3y dy = 0. \quad 3$$

(vi) Find the singular solution of the differential equation :

$$4xb^2 = (3x - a)^2 \text{ and solve.} \quad 3$$

(vii) Integrate :

$$\frac{x}{1+x} dx. \quad 3$$