

Subject : Mathematics

Paper – II : (Differential Equations)

Time : 3 Hours

Max. Marks: 80

PART – A (5 x 4 = 20 Marks)

(Short Answer Type)

Note : Answer any FIVE of the following questions.

1. Solve $(1 + e^{x/y}) dx + e^{x/y}(1 - x/y) dy = 0$
2. Solve $x^2 p^2 + xyp - 6y^2 = 0$
3. Solve $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$ with $y = 0$, $x = 0$ and $\frac{dy}{dx} = 0$.
4. Solve $(D^4 - 1)y = \sin x$.
5. Solve $(D^2 - 3D + 2)y = \sin e^{-x}$ using variation of parameters.
6. Solve $x^2 y'' - xy' + y = 0$ given $y_1 = x$ as a solution.
7. Form a partial differential Equation from $z = f(x^2 + y^2)$ eliminating arbitrary function f .
8. Solve $(y - z)p + (x - y)q = z - x$.

PART – B (4 x 15 = 60 Marks)

(Essay Answer Type)

Note: Answer ALL from the questions.

- 9 (a) Show that the necessary and sufficient condition for the differential equation $Mdx + Ndy = 0$ to be exact is that $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

OR

(b) Solve $y + px = x^4 p^2$

10. (a) Solve $\frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = x \cos x$

OR

(b) Solve $(D^2 - 2D + 1)y = e^x x^2$.

11. (a) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x$

OR

(b) Use method of undetermined coefficients to solve $(D^2 - 3D + 2)y = 2x^2 + 3e^{2x}$.

12 (a) Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.

OR

(b) Integrate and hence obtain a solution of $\frac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + \sin(2x - y) = 0$
