

Name of Course	:CBCS B.Sc. (Math Sci)- II /B.Sc. (Phy Sci)-II/
Unique Paper Code	: 42357501_OC
Name of Paper	:DSE-Differential Equations
Semester	:V
Duration	:3 Hours
Maximum Marks	:75 Marks

Attempt any four questions. All questions carry equal marks.

1. Find the Wronskian of

$$\{e^t, e^{-t}, e^{3t}\}. \text{ Are these vectors linearly independent?}$$

Solve

$$y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$$

2. Solve

$$\frac{d^2y}{dx^2} + 2y = x^2e^{3x}$$

Solve

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

3. Solve the Initial Value Problem

$$\frac{d^2y}{dx^2} + 4y = \frac{1}{2} \sin 3x, \quad y(0) = 0, \quad y'(0) = 0$$

Solve

$$(2x + 1)^2 \frac{d^2y}{dx^2} - 2(2x + 1) \frac{dy}{dx} - 12y = 6x$$

4. Solve the equation using method of Variation of Parameters

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

Solve the Simultaneous Equations

$$\frac{dx}{dt} - \frac{dy}{dt} + 2y = \cos 2t, \quad \frac{dx}{dt} + \frac{dy}{dt} - 2x = \sin 2t$$

5. Find the general solution of the partial differential equation:

$$2xy \frac{\partial z}{\partial x} + (x^2 + y^2) \frac{\partial z}{\partial y} = 0$$

Find the complete integral of the partial differential equation $(p + q)(px + qy) = 1$, by

$$\text{using Charpit's method, where } p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}.$$

6. Form a partial differential equation given by $z = xy + f(x^2 + y^2)$, where f is an arbitrary function.

Classify and transform the equation $\frac{\partial^2 z}{\partial x^2} + y \frac{\partial^2 z}{\partial y^2} - x \frac{\partial z}{\partial y} + y = 0$ into the canonical

form and then find the general solution.