Name of Course	: **B.A. (Prog.) DSE: Mathematics**
Unique Paper Code	: **62357502**
Name of Paper	: **Differential Equations**
Semester	: **V**
Duration	: **3 hours**
Maximum Marks	: **75 Marks**

Attempt any four questions. All questions carry equal marks.

1. Solve the differential equation

$$(4x + 3y^2)\,dx + 2xy\,dy = 0.$$

Also, show that the solutions e^x, e^{-x}, e^{2x} of

$$\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = 0$$

are linearly independent and hence or otherwise find the general solution.

2. Solve the following differential equation

$$y'' - 3y' + 2y = 3e^{-x} - 10\cos x\,, y(0) = 1, y'(0) = 2.$$

Also, solve the differential equation

$$x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 20y = (x+1)^2.$$

3. Using the method of variation of parameters, solve

$$\frac{d^2y}{dx^2} + 4y = \sec^2 2x.$$

Also, solve

$$(y^2 + z^2 - x^2)dx - 2xydy - 2xzdz = 0.$$

4. Solve the differential equations

$$\frac{dx}{y + zx} = \frac{dy}{-(x + zy)} = \frac{dz}{x^2 - y^2}.$$

Also, solve

$$\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^x + \cos x.$$

5. Classify the following partial differential equation into elliptic, parabolic or hyperbolic

$$\sin^2 x \frac{\partial^2 z}{\partial x^2} + 4\cos x \frac{\partial^2 z}{\partial x \partial y} - 4\frac{\partial^2 z}{\partial y^2} = 0.$$

Also, solve the following partial differential equation

$$(mz - ny)p + (nx - lz)q = ly - mx.$$

6. Form a partial differential equation by eliminating the arbitrary function f from the equation

$$x + y + z = f(x^2 + y^2 + z^2).$$

Also, find a complete integral of partial differential equation

$$px + qy = pq.$$