Name of Course	: **CBCS B.Sc. (Math Sci)- II/ B.Sc. (Phy Sci)-II/ B.Sc. (Life Sci)-II/ Applied Sciences-II**
Unique Paper Code	: **42357501**
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. Define an exact differential equation. For the following equation find value of A such that the equation is exact and solve that equation

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

Solve the differential equation $4y = x^2 + p^2$.

2. Given that $y = x^2$ and $y = x^5$ are solution of the corresponding homogeneous equation of the differential equation

$$x^2\frac{d^2y}{dx^2} - 6x\frac{dy}{dx} + 10y = 3x^4 + 6x^3.$$

Using this, find general solution of this non-homogeneous equation.

3. Solve the following system of equations

$$\frac{dx}{dt} + \frac{dy}{dt} - x - 3y = e^t$$

$$\frac{dx}{dt} + \frac{dy}{dt} + x = e^{3t}.$$

4. Solve the differential equation

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

Solve initial value problem

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 0, \quad y(0) = 1, \quad y'(0) = 6.$$

5. Find the integral of $q = (z + px)^2$ using Charpit's Method.

Eliminate the arbitrary function f from the equation

$$z = x + y + f(xy).$$

6. Reduce the equation

$$\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$$

to canonical form.