Your Roll No...............

Sr. No. of Question Paper : **2153**   **H**

Unique Paper Code   : 62357604

Name of the Paper   : Differential Equations

Name of the Course   : **B.A. (Prog.)**

Semester   : VI

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **two** parts from each question.

3. **All** questions are compulsory.

1. (i) Solve the differential equation

   $$(2x \cos y + 3x^2 y)\, dx + (x^3 - x^2 \sin y - y)\, dy = 0$$

   (6)

   (ii) Solve the differential equation

   $$y^2 dx + (3xy - 1)dy = 0$$

   (6)

(iii) Solve the following differential equation

$$p^2 x \, (x - 2) \div p \, (2y - 2xy - x \div 2) \div y^2 \div y = 0$$

(6)

2. (i) Find the general solution of

$$y'' - 6y' \div 25y = 0 \tag{6}$$

(ii) Given that e^{-x}, e^{3x} and e^{4x} are all solution of

$$y''' - 6y'' \div 5y' \div 12y = 0$$

Show that they are linearly independent on the interval $-\infty < x < \infty$. (6)

(iii) Solve the equation

$$x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} \div 2y = 0 \tag{6}$$

3. (i) Find the general solution of the given differential equation using variation of parameter method.

$$y'' \div y = \tan x \tag{6.5}$$

(ii) Solve

$$\frac{dx}{dt} - 7x + y = 0$$

$$\frac{dy}{dt} - 2x - 5y = 0 \qquad (6,5)$$

(iii) Solve

$$\frac{dx}{x(x+y)} = \frac{dy}{y(x+y)} = \frac{dz}{(x-y)(2x+2y+z)} \qquad (6,5)$$

4. (i) Eliminate the arbitrary function f and form the PDE :

$$z = e^{ax+by} f(ax - by) \qquad (6)$$

(ii) Find the general solution of the equation

$$2(xp - yq) = y^2 - x^2 \qquad (6)$$

(iii) Find the complete integral of

$$(p^2 + q^2)y = qz \qquad (6)$$

5. (i) Find the partial differential equation of all spheres of radius a having their centers in the yz-plane. (6,5)

(ii) Find the general solution of the equation

$$(y - z)p + (z - x)q = x - y \qquad (6.5)$$

(iii) Find the complete integral of $px + qy = pq$.

$$(6.5)$$

6.   (i) Find the general solution of the equation

$$(y + zx)p - (x + yz)q = x^2 - y^2 \qquad (6.5)$$

(ii) Find a complete integral of

$$(p + q)(px + qy) = 1 \qquad (6.5)$$

(iii) Classify the Partial Differential Equation :

$$xu_{xx} + tu_{xt}u_{tt} = 0 \qquad (6.5)$$