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Your Roll No. 2023

Sr. No. of Question Paper : 4960  
Unique Paper Code : 62357604  
Name of the Paper : Differential Equations  
Name of the Course : B.A. (Prog.)  
Semester : VI  
Duration : 3 Hours

E



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.

Q.1

(i) Solve the differential equation

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

6

(ii) Solve the differential equation

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

6

(iii) Solve the following differential equation

$$e^{4x} (p - 1) + e^{2y} p^2 = 0$$

by reducing it to Clairaut form using the transformation

$$e^{2x} = u \text{ and } e^{2y} = v.$$

6

P.T.O.

Q.2

(i) Find the general solution of

$$y''' - 5y'' + 7y' - 3y = 0$$

6

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

$$y''' - 6y'' + 5y' + 12y = 0$$

Show that they are linearly independent on the interval  $-\infty < x < \infty$  and write the general solution.

6

(iii) Solve the equation

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

Q.3

6

(i)

Find the general solution of the given differential equation using variation of parameter method.

$$y'' + y = \tan x$$

(ii) Solve

6.5

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

$$\frac{dy}{dt} + 2x + 5y = 0$$

6.5

(iii) Solve

$$\frac{dx}{y^3x - 2x^4} = \frac{dy}{2y^4 - x^3y} = \frac{dz}{9z(x^3 - y^3)}$$

6.5

Q.4

(i) Form the partial differential equation of the equation :

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

6

(ii) Find the general solution of the equation

$$2(xp - yq) = y^2 - x^2$$

6

(iii) Find the complete integral of  $z = pq$

6

Q.5

(i) Find the partial differential equation of all spheres having their centers in the  $xy$ -plane.

6.5

(ii) Find the general solution of the equation

$$x^2p + y^2q = (x + y)z$$

6.5

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

6.5

Q.6

(i) Find the general solution of the equation

$$y^2p - xyq = x(z - 2y)$$

6.5

P.T.O.

(ii) Find a complete integral of  $p = (z + qy)^2$

6.5

(iii) Reduce the equation  $r - x^2t = 0$  to the canonical form.

6.5

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Your Roll No. 2023

Sr. No. of Question Paper : 4986

E

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**

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2. Attempt any two parts from each question.
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Q. 1

(i) Solve the initial value problem that consists of the differential equation

$$x \sin y \, dx + (x^2 + 1) \cos y \, dy = 0$$

and the initial condition  $y(1) = \frac{\pi}{2}$ .

6

(ii) Solve the differential equation

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

6

(iii) Solve the differential equation

$$p^2 (x^2 - a^2) - 2pxy + y^2 - b^2 = 0$$

6

Q.2

(i) Find the general solution of

$$y'' - 6y' + 25y = 0$$

6

(ii) Given that  $x$ ,  $x^2$  and  $x^4$  are all solution of

$$x^3 y''' - 4x^2 y'' + 8xy' - 8y = 0$$

Show that they are linearly independent on the interval  $0 < x < \infty$  and write the general solution.

6

(iii) Solve the differential equation using variation of parameter method

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

6

Q.3

(i) Solve the differential equation

$$x^3 \frac{d^3 y}{dx^3} - 4x^2 \frac{d^2 y}{dx^2} + 8x \frac{dy}{dx} - 8y = 0$$

6.5

(ii) Solve

$$\frac{d^2 x}{dt^2} - 3x - 4y = 0$$

$$\frac{d^2 y}{dt^2} + x + y = 0$$

6.5

(iii) Solve

$$\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$$

6.5

Q.4

(i) Find the partial differential equation by eliminating the arbitrary function  $f$  from the equation

$$f(x^2 + y^2 + z^2, z^2 - 2xy) = 0$$

6

(ii) Find the general solution of the equation

$$(x - y)y^2p + (y - x)x^2q - (x^2 + y^2)z = 0$$

6

(iii) Find a complete integral of

$$(p + q)(px + qy) = 1$$

6

Q.5

(i) Form partial differential equation from the equation

$$2z = (ax + y)^2 + b; \quad a, b \text{ are arbitrary constant.}$$

6.5

(ii) Find the general solution of the equation

$$px(z - 2y^2) = (z - qy)(z - y^2 - 2x^3)$$

6.5

(iii) Find the complete integral of the equation

$$2xz - px^2 - 2qxy + pq = 0$$

6.5

Q.6

(i) Form partial differential equation from the equation

$$ax^2 + by^2 + z^2 = 1$$

6.5

(ii) Find the general solution of the equation

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

6.5

(iii) Reduce the equation  $r - t = 0$  to the canonical form

6.5