Unit III

6. (a) Solve the equation by removing first derivative :

$$\frac{d^2y}{dx^2} - 2\tan x.\frac{dy}{dx} + 5y = (\sec x).e^x . \qquad \textbf{4}$$

(b) Solve : **4**

$$\frac{d}{dx}\left(\cos^2 x.\frac{dy}{dx}\right) + y.\cos^2 x = 0 .$$

7. (a) Solve : **4**

$$\cos x.\frac{d^2y}{dx^2} + \sin x\frac{dy}{dx} - 2y\cos^3 x = 2\cos^5 x + \cos^2 x \cdot$$

(b) Apply the method of variation of parameters to solve :

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

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B.Sc. EXAMINATION, 2026

(Second Semester)

(Re-appear Only)

MATH

Paper BM-122

Ordinary Differential Equations

Time : 3 *Hours*] [*Maximum Marks :* 40

Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) Give geometrical meaning of the solution of the differential equation : **1.5**

$$\frac{dy}{dx} = \frac{-x}{y}.$$

(b) Define Clairaut's equation. **1.5**

(c) Define Homogeneous linear differential equation. **1.5**

(d) Solve : $\frac{d^2y}{dx^2} + a^2y = 0$. **2**

(e) Define total differential equation. **1.5**

Unit I

2. (a) Solve : **4**

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

(b) Find A such that the differential equation $(x^2 + 3xy)dx + (4x^2 + 4y)dy = 0$ is exact. Solve the resulting exact equation. **4**

3. (a) Solve the differential equation : **4**

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

(b) Solve the differential equation :

$xp + y = x^4p^2.$ **4**

Unit II

4. (a) Find the orthogonal trajectories of the family of cardiods $r = a(1 + \cos\theta)$, being a parameter. **4**

(b) Solve the differential equation :

$$\frac{d^2y}{dx^2} + y = \text{cosec } x.$$ **4**

5. (a) Solve :

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

(b) Solve the differential equation :

$$x\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} = \frac{1}{x}.$$ **4**

Unit IV

8. (a) Solve the simultaneous equations :

$$\frac{dx}{dt} = 2y, \frac{dy}{dt} = 2z, \frac{dz}{dt} = 2x \,. \qquad \textbf{4}$$

(b) Solve the simultaneous equations :

$$\frac{dx}{y - zx} = \frac{dy}{x + yz} = \frac{dz}{x^2 + y^2} \,. \qquad \textbf{4}$$

9. (a) Solve the differential equation :

$(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0.$ **4**

(b) Solve the differential equation :

$xz^3dx - zdy + 2ydz = 0.$ **4**

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Unit IV

8. (a) Solve the simultaneous equations :

$$\frac{dx}{dt} = 2y, \frac{dy}{dt} = 2z, \frac{dz}{dt} = 2x \,. \qquad \textbf{4}$$

(b) Solve the simultaneous equations :

$$\frac{dx}{y - zx} = \frac{dy}{x + yz} = \frac{dz}{x^2 + y^2} \,. \qquad \textbf{4}$$

9. (a) Solve the differential equation :

$(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0.$ **4**

(b) Solve the differential equation :

$xz^3dx - zdy + 2ydz = 0.$ **4**

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