Roll No. .....

(05/16-I)

# 5180

## B.A./B.Sc. EXAMINATION

(Second Semester)

MATHEMATICS

BM-122

Ordinary Differential Equation

*Time : Three Hours* *Maximum Marks :* $\begin{cases} \text{B.A. : 26} \\ \text{B.Sc. : 40} \end{cases}$

**Note** : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **9** is compulsory. Marks in bracket for B.A.

### Unit I

1. (a) Solve : 4(2½)

$$\left(3x^2y^4 + 2xy\right)dx + \left(2x^3y^3 - x^2\right)dy = 0$$

(b) Verify that the differential equation :

$$xdx + ydy = \frac{a^2(xdy - ydx)}{x^2 + y^2}$$

is exact and solve it. 4(2½)

2. (a) Solve the differential equation $y = 3x + \log p$. 4(2½)

(b) Solve the differential equation :

$$\sin px \cos y = \cos px \sin y + p$$

and obtain the singular solution. 4(2½)

## Unit II

3. (a) Find the orthogonal trajectory of $x^2 + y^2 + 2gx + c = 0$, where C is a parameter. 4(2½)

(b) Solve the differential equation : 4(2½)

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}$$



4. (a) Solve the differential equation : 4(2½)

$$\frac{d^3y}{dx^3} + y = 3 + e^{-x} + 5e^{2x}$$

(b) Solve : 4(2½)

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

## Unit III

5. Solve : 8(5)

$$(x+2)\frac{d^2y}{dx^2} - (2x+5)\frac{dy}{dx} + 2y = (x+1)e^x$$

6. Solve $x^2\frac{d^2y}{dx^2} - 2x(1+x)\frac{dy}{dx} + 2(1+x)y = x^3$ by variation of parameter method. 8(5)

## Unit IV

7. (a) Solve the simultaneous equations : 4(2½)

$$t\frac{dx}{dt} + y = 0, t\frac{dy}{dt} + x = 0$$

given that $x(1) = -1$, $y(-1) = 0$.

(b) Solve : 4(2½)

$$\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{xyz^2\left(x^2 - y^2\right)}$$

8. (a) Solve the differential equation : 4(2½)

$$yz \log z dx - zx \log z dy + xydz = 0$$

(b) Solve : 4(2½)

$$(x - 3y - z)dx + (2y - 3x)dy + (z - x)dz = 0$$

## Unit V

9. (a) Write the condition for exactness of the differential equation $Mdx + Ndy = 0$. 1(1)

(b) Solve the differential equation : 1(1)

$$p = \tan(px - y)$$

(c) Define homogeneous linear equations. 2(1)

(d) Define Orthogonal Trajectory. 2(1½)

(e) Write the necessary condition for the integrability of total differential equation. 2(1½)