Total No. of Questions : 8] [Total No. of Printed Pages : 3

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# B.A./B.Sc. (General) IIIrd Semester (0003) Examination

# 0242

## MATHEMATICS

## (Paper : II)

(Differential Equations-I)

**Time : 3 Hours]** **[Maximum Marks : 30**

*Note* :- Attempt *five* questions, selecting at least *two* from each Unit. Each question carries 6 marks.

### Unit–I

1. (a) Define exact differential equation and solve $(\cos x \sinh y + 1)\, dx + \sin x \cosh y\, dy = 0$ by proving it is exact. 1+2

(b) Solve :

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

2. (a) Solve :

$$y - 2px = \tan^{-1}(xp^2)$$

(b) Solve :

$$(px - y)(py + x) = h^2p$$ 3,3

A-67 Turn Over

( 1 )

3. (a) Find singular solution of :

$$3y = 2px - \frac{2p^2}{x}$$

(b) Find orthogonal trajectories of $y^2 = 4ax$.

4. (a) Solve :

$$(D^2 + 4)y + \cos 2x + e^x$$

(b) Solve :

$$(D^2 - 4D + 4)y = \sinh 2x$$

## Unit–II

5. (a) Solve the differential equation :

$$(x^3D^3 + 6x^2D^2 + 4xD - 4)y = (\log x)^2$$

(b) Solve :

$$\{(2x - 1)^3D^3 + (2x - 1)D - 2\}\ y = 0$$

6. (a) Use method of reduction of order to solve :

$$(D^2 + a^2)y = \sec ax$$

(b) Solve the method of variation of parameters :

$$(D^2 + 4)y = \sin 2x$$

7. (a) Verify that $y = e^x$ is solution of $(x - 1)y'' - xy' + y = 0$ and use this fact to find general solution of $(x - 1)y'' - xy' + y = 1$.

(b) Solve :

$$[(x^3 - 4x)D^3 + (9x^2 - 12)D^2 + 18xD + 6]y = 0 \quad 3,3$$

8. (a) Solve :

$$\frac{dx}{dt} = ax + by \text{ and } \frac{dy}{dt} = bx + ay$$

(b) Use operator method to find general solution of the linear system :

$$2\frac{dx}{dt} + \frac{dy}{dt} + x + y = t^2 + 4t$$

$$\frac{dx}{dt} + \frac{dy}{dt} + 2x + 2y = 2t^2 - 2t \quad 3,3$$

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