(i) Printed Pages : 3] Roll No. .....

(ii) Questions : 8] **Sub. Code :** 0 2 4 2

Exam. Code : 0 0 0 3

B.A./B.Sc. (General) 3rd Semester Examination

1127

MATHEMATICS

(Differential Equations–I)

Paper : II

Time : 3 Hours] **[Max. Marks : 30**

Note :– Attempt *five* questions, selecting at least *two* questions from each Unit.

Unit–I

1. (a) Is integrating factor of $Mdx + Ndy = 0$ unique. Justify.

   (b) State and Prove sufficient condition for $Mdx + Ndy = 0$ to be exact. 3,3

2. (a) Solve :

$$x^2p^2 - 2xyp + 2y^2 - x^2 = 0$$

(b) Solve :

$$\frac{2y}{x} - p = f\left(\frac{px - y}{x^2}\right)$$ 3,3

3. (a) Find singular solution of $3p^2e^2 - px + 1 = 0$.

(b) Find orthogonal trajectories of family of ellipses with centres at (0, 0) and two vertices at (1, 0), (–1, 0). 3,3

4. (a) Solve :

$$(D^4 - D^2)\ y = 4$$

(b) Solve :

$$(D^2 - 4D + 4)y = e^{2x} \cos^2 x$$ 3,3

Unit–II

5. (a) Solve :

$$(x^2D^2 + xD - 9)y = 0$$

given that $y = x^3$ is a solution.

(b) Solve by method of variation of parameters :

$$(D^2 - 1)y = 2(1 - e^{-2x})^{-1/2}$$ 3,3

6. Reduce :

$$2x^2y\frac{d^2y}{dx^2}+4y^2=x^2\left(\frac{dy}{dx}\right)^2+2xy\left(\frac{dy}{dx}\right)$$

to Cachy's form and hence solve it. 6

7. (a) Solve :

$$[(1+x)^2D^2+(1+x)\,D+1]\,y = 4\cos[\log(1+x)]$$

(b) Solve :

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

by changing the independent variable. 3,3

8. (a) Find general solution of the linear system :

$$\frac{dx}{dt}=-2x+7y$$

$$\frac{dy}{dt}=3x+2y$$

(b) Solve : $Dx + 4Dy = 3y$ and $D^2x - Dy = 2x + 2t$

where $D = \frac{d}{dt}$. 3,3