

(i) Printed Pages : 2

Roll No. ....

(ii) Questions : 8

Sub. Code : 

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Exam. Code : 

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**B.A./B.Sc. (General) 3<sup>rd</sup> Semester**

**1128**

**MATHEMATICS**

**Paper-II (Differential Equations—I)**

**Time Allowed : Three Hours]**

**[Maximum Marks : 30**

**Note :—** (1) Attempt **five** questions in all, selecting at least **two** from each Unit.

(2) Each question carries equal marks.

**UNIT-I**

1. (a) Find the necessary and sufficient condition that the equation  $Mdx + Ndy = 0$  (where M and N are functions of x and

y with the condition that M, N,  $\frac{\partial M}{\partial y}$ ,  $\frac{\partial N}{\partial x}$  are continuous

functions of x and y) may be exact. 3

(b) Solve  $(2x^2y^2 + y)dx - (x^3y - 3x)dy = 0$ . 3

2. (a) Solve  $y = 2px + y^2p^3$ . 3

(b) Solve  $x^2(y - px) = p^2y$ . 3

3. (a) Solve and test for singular solution :

$$p^3 - 4pxy + 8y^2 = 0 \quad 3$$

(b) Find the orthogonal trajectory of the curve  $x^2y = c$ . 3

4. (a) Solve the differential equation :

$$\frac{d^3y}{dx^3} - 5\frac{d^2y}{dx^2} + 7\frac{dy}{dx} - 3y = e^{2x} \cosh x \quad 3$$

(b) Solve  $\frac{d^2y}{dx^2} + a^2y = \sec ax$ . 3

### UNIT-II

5. (a) Solve  $(x^2D^2 - xD + 4)y = \cos(\log x) + x \sin(\log x)$ . 3

(b) Define Legendre's linear equation and solve it. 3

6. (a) Solve  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx}(\tan x) + 3y = 3 \tan^2 x \sec x$ . 3

(b) Use method of reduction of order to solve :

$$\frac{d^2y}{dx^2} + 16y = \sec 4x. \quad 3$$

7. (a) Solve  $x^2 \frac{d^2y}{dx^2} - 2x(1+x) \frac{dy}{dx} + 2(1+x)y = x^3$ . 3

(b) Solve  $(D^2 + 4)y = 4 \sec^2 2x$  by the method of variation of parameters. 3

8. Verify that  $y = e^x$  is a solution of  $(x-1)y'' - xy' + y = 0$ .  
Use this fact to find the general solution of  
 $(x-1)y'' - xy' + y = 1$ . 6