

B.Sc. I (C.B.C.S. Pattern) Sem-II  
**USMT-03 - Mathematics Paper-I**  
**(Ordinary Differential Equations and Difference Equations)**

P. Pages : 2

GUG/S/19/11586

Time : Three Hours



Max. Marks : 60

- Notes : 1. Solve all **five** questions.  
2. All questions carry equal marks.

**UNIT - I**

1. a) Solve  $(x^2 + y^2 + 2x)dx + 2ydy = 0$  by making it exact. 6

b) Solve  $\frac{dy}{dx} + y = \frac{1}{1 + e^{2x}}$ . 6

**OR**

c) Solve  $\cos x dy = y(\sin x - y)dx$ . 6

d) Find the orthogonal trajectories of the Cardioids  $r = a(1 - \cos \theta)$  6

**UNIT - II**

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

b) Solve  $\frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2 + 2x + 4$ . 6

**OR**

c) Solve  $\frac{dx}{dt} + 4x + 3y = t$ ,  $\frac{dy}{dt} + 2x + 5y = e^t$ . 6

d) Solve  $(D^2 + 4D + 3)y = e^{-3x}$  where  $D = \frac{d}{dx}$ . 6

**UNIT - III**

3. a) Solve  $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = x^2 + 2x + 4$ . 6

b) Solve  $(x^2 D^2 - xD + 4)y = \cos(\log x)$  where  $D_y = \frac{dy}{dx}$ . 6

**OR**

- c) If  $y_1(x)$  and  $y_2(x)$  are two solutions of the differential equation  $y'' + p(x)y' + Q(x) = 0$  on  $[a, b]$  then prove that they are linearly dependent on this interval iff their Wronskian  $w(y_1, y_2) = y_1 y_2' - y_2 y_1'$  is identically zero. 6
- d) Solve  $y'' + y = \operatorname{cosec} X$  by the method of variation of parameters. 6

#### UNIT - IV

4. a) From the equation  $y_n = (A + B_n)3^n$ , derive a difference equation by eliminating arbitrary constants A and B. 6

- b) Solve the equation  $y_{n+2} - 2 \cos \alpha y_{n+1} + y_n = 0$ . 6

**OR**

- c) Solve the equation 6

$$y_{n+3} - 5y_{n+2} + 3y_{n+1} + 9y_n - 2^n + 3^n = 0.$$

- d) Solve the equation  $y_{k+1} + \frac{1}{4}y_k = (1/4)^k, k \geq 0, y(0) = 1$ . 6

5. Solve **any six**.

- a) Test the differential equation for exactness 2

$$(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0.$$

- b) Write the Clairaut's equation. 2

- c) Solve  $2y'' + 2y' + 3y = 0$ . 2

- d) Find particular integral of  $(D^2 + 1)y = \sin 2x$  where  $D = \frac{d}{dx}$ . 2

- e) Find the complementary function of 2

$$(x^2 D^2 - 3xD + 4)y = 0.$$

- f) If  $f(x)$  and  $g(x)$  are any two differentiable functions of  $x$  then write the Wronskian of them. 2

- g) Solve the difference equation 2

$$\Delta^2 y_n - 3\Delta y_n + 2y_n = 0.$$

- h) Solve the difference equation 2

$$4y_{n+2} - 4y_{n+1} + y_n = 0.$$

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