

B.Sc. I (CBCS Pattern) Sem-II
**USMT03 - Mathematics Paper-I : Ordinary Differential Equations and
Difference Equations**

P. Pages : 2

Time : Three Hours



GUG/W/22/11586

Max. Marks : 60

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

UNIT – I

1. a) Test the DE $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$ for exactness and solve if it is exact. **6**

b) Solve $y' + y = \frac{1}{1 + e^{2x}}$ **6**

OR

c) Solve the differential equation **6**
 $x \frac{dy}{dx} + y = x^3 y^6$

d) Find the orthogonal Trajectories of the family of semicubical parabolas $ay^2 = x^3$. **6**

UNIT – II

2. a) Solve $(D^3 - 7D - 6)y = e^{2x}(1 + x)$ **6**

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

OR

c) Solve $\frac{d^2y}{dx^2} + 4y = x \sin x + 2^x$ **6**

d) Solve $\frac{dx}{dt} + 4x + 3y = t$ and $\frac{dy}{dt} + 2x + 5y = e^t$ **6**

UNIT – III

3. a) Solve $x^2 \frac{d^2y}{dx^2} - 8x \frac{dy}{dx} + 8y = \log x$ **6**

b) Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 4y = \cos(\log x)$ 6

OR

c) Prove that the Wronskian of two linearly independent solutions of $y'' + py' + qy = 0$ never vanishes. 6

d) Solve $y'' + y = \sec^2 x$ by the method of variation of parameters. 6

UNIT – IV

4. a) From the equation $y_n = (A + Bn)3^n$, derive a difference equation by eliminating constant A & B. 6

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

OR

c) Solve $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$. Given $u_0 = 0, u_1 = 1$. 6

d) Solve the Difference equation $y_{n+2} - 2y_{n+1} + y_n = n^2 \cdot 2^n$. 6

5. Solve **any six**.

a) Obtain the solution of $y' + py = Q$, where P and Q are the function of x alone. 2

b) Solve $p^2 - 4p + 3 = 0$ where $p = \frac{dy}{dx}$. 2

c) Solve $(D^3 - 3D^2 + 3D - 1)y = 0$ 2

d) Find P.I. of $(D+1)y = e^{2x}$ 2

e) Define Wronskian of y_1 and y_2 . 2

f) Find the complimentary function of DE 2
 $(x^2D^2 - 3xD + 4)y = 2x^2$

g) Solve $(\Delta^2 - 3\Delta + 2)y_n = 0$ 2

h) Solve $y_{n+3} - 2y_{n+2} - 5y_{n+1} + 6y_n = 0$. 2
