

B.Sc.- II (CBCS Pattern) Semester-II
**USMT-03 - Mathematics Paper-I - Ordinary Differential Equations and
Difference Equations**

P. Pages : 2

Time : Three Hours



GUG/W/24/11586

Max. Marks : 60

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

UNIT-I

1. a) Show that DE **6**
 $(\sin x \cdot \cos y + e^{2x})dx + (\cos x \cdot \sin y + \tan y)dy = 0$ is exact and solve them.
- b) Solve the DE $(1 - x^2)\frac{dy}{dx} + xy = y^2x$. **6**

OR

- c) Solve the DE $3x^4p^2 - xp - y = 0$. Where $p = \frac{dy}{dx}$. **6**
- d) Find the orthogonal trajectories of the family of curves **6**
 $x^2 - y^2 = a^2$

UNIT-II

2. a) Solve the DE **6**
 $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin 2x$
- b) Solve the DE **6**
 $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = e^{2x}(1+x)$

OR

- c) Solve $\frac{dx}{dt} + 7x - y = 0$, $\frac{dy}{dt} + 2x + 5y = 0$ **6**
- d) Solve the DE $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = x^2$ **6**

UNIT-III

3. a) Solve the DE $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10 \left(x + \frac{1}{x} \right)$ 6
- b) Solve $(x^2 D^2 - 3xD + 5)y = x^2 \sin(\log x)$. 6

OR

- c) Let $y_1(x)$ and $y_2(x)$ be any two solution of the DE $y'' + py' + qy = 0$. Then prove that they are linearly dependent iff their Wronskian $W(x)$ is identically zero. 6
- d) Solve the DE $\frac{d^2 y}{dx^2} - y = \frac{2}{1+e^x}$, by variation of parameters. 6

UNIT-IV

4. a) Solve $y_{n+3} - 5y_{n+2} + 3y_{n+1} + 9y_n = 3^n$ 6
- b) From the equation $y_n = A(2)^n + B(3)^n$, derive a difference equation by eliminating the constant. 6

OR

- c) Solve $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$. 6
- d) Solve $u_{n+2} - 4u_n = n^2$. 6

5. Solve any six.

- a) Find the integrating factor of DE $(1+x^2)dy + 2xy dx = \cot x dx$. 2
- b) Solve the DE $p^2 - 5p + 6 = 0$, where $p = \frac{dy}{dx}$. 2
- c) Solve the DE $y'' + 5y' + 4y = 0$ 2
- d) Find the particular integral of $(D^2 + 4)y = \cos 2x$. 2
- e) Find the complementary function of $(x^2 D^2 - xD + 4)y = 0$ 2
- f) Define the Wronskian. 2
- g) Solve the difference equation $(\Delta^2 - \Delta + 1)y_n = 0$ 2
- h) Find the particular integral of $y_{k+1} + \frac{1}{4}y_k = \left(\frac{1}{4}\right)^k$ 2
