

USMT-03 - Mathematics Paper-I (Ordinary Differential Equations and Difference Equations)

P. Pages : 2

Time : Three Hours



GUG/W/23/11586

Max. Marks : 60

- Notes : 1. Solve all the **five** questions.
2. Each question carry equal marks.

UNIT - I

1. a) Show that DE $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^3)dy = 0$ is exact and hence solve it 6

b) Solve $(1 + y^2)dx = (\tan^{-1} y - x)dy$ 6

OR

c) Solve $xy - \frac{dy}{dx} = y^3 e^{-x^2}$ 6

d) Prove that the system of confocal conics $\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$ is self orthogonal. 6

UNIT - II

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

b) Find the solution of $y'' - 4y' + 4y = e^{2x} + \sin 2x$ 6

OR

c) Solve the system: $D^2x - 2y = 0$ and $D^2y + 2x = 0$ 6

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

UNIT - III

3. a) Find the complimentary function and particular integral of the DE $(x^2D^2 - 3xD + 4)y = 2x^2$ 6

b) If y_1 & y_2 are linearly dependent differentiable functions then show that their Wronskian vanishes identically. Also prove the converse of this statements. 6

OR

c) Solve the DE: $y'' + n^2y = \operatorname{cosec} nx$, by the method of variation of parameters. 6

- d) Solve $(x^2D^2 - xD + 4)y = \cos(\log x)$. 6

UNIT - IV

4. a) Deduce the difference equation representing a family of parabolas $y = ax^2$. 6

- b) Solve: $4y_{n+2} - 4y_{n+1} + y_n = 0$. 6

OR

- c) Solve $y_{n+3} - 5y_{n+2} + 3y_{n+1} + 9y_n = 2^n + 3^n$. 6

- d) Solve $u_{x+1} - u_x = (x^2 - 2x)2^x$. 6

5. Solve **any six**.

- a) Define the linear equations. 2

- b) Reduce the equation $\cos x dy = y(\sin x - y) dx$ to linear equation. 2

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

- d) Find that particular integral of $(D^2 + 1)y = \sin 2x$. 2

- e) Find the Wronskian for $y'' + y = \sec^2 x$. 2

- f) Find C. F. for $x^2 \frac{d^2y}{dx^2} - 8x \frac{dy}{dx} + 8y = \log x$. 2

- g) Write the E form of the equation $\Delta^2 y_n - 3\Delta y_n + 2y_n = 0$. 2

- h) Define the difference equation & order of the difference equation. 2
