

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

P. Pages : 2

Time : Three Hours



GUG/S/25/11586

Max. Marks : 60

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

UNIT – I

1. a) Test the differential equation $(\sin x \cdot \sin y - xe^y)dy = (e^y + \cos x \cdot \cos y)dx$ for exact and solve if exact. 6
- b) Solve $(1-x^2)\frac{dy}{dx} + 2xy = x(1-x^2)^{1/2}$. 6

OR

- c) Solve the DE $\cos x \, dy = y (\sin x - y) \, dx$. 6
- d) Find the orthogonal trajectories of the family of coaxial circles $x^2 + y^2 + 2gx + c = 0$. 6

UNIT – II

2. a) Prove that $\frac{1}{D-a} V = e^{ax} \int V e^{-ax} dx$. Hence find $\frac{1}{D-2} x e^{3x}$ 6
- b) Find P.I. $\frac{1}{D^2-4} e^{2x}$. 6

OR

- c) Solve $y'' - 4y' + 4y = e^{2x} + \sin 2x$. 6
- d) Solve $\frac{dx}{dt} + 7x - y = 0$, $\frac{dy}{dt} + 2x + 5y = 0$ 6

UNIT – III

3. a) Prove that any two linearly independent functions y_1 and y_2 satisfy the DE 6
$$u'' + \frac{y_2 y_1'' - y_1 y_2''}{W} u' + \frac{y_1' y_2'' - y_2' y_1''}{W} u = 0$$
- b) Solve $x^2 \frac{d^2 y}{dx^2} - 8x \frac{dy}{dx} + 8y = \log x$ 6

OR

- c) Solve $(x+a)^2 \frac{d^2y}{dx^2} - 4(x+a) \frac{dy}{dx} + 6y = x$ 6
- d) Find a particular solution of $y'' + y = \operatorname{cosec} x$ by the method of variation of parameter. 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 Difference equation $(\Delta^2 - 3\Delta + 2)y_n = 0$ 6

OR

- c) Solve $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ given $u_0 = 0, u_1 = 1$. 6
- d) Solve $u_{n+2} - 4u_n = n^2 + n - 1$. 6
5. Attempt **any six**.
- a) Test differential equation $(y^2 + 2x^2y)dx + (2x^3 - xy)dy = 0$ for exactness. 2
- b) Solve $P = \log(px - y)$. 2
- c) Solve $(D^2 + a)y = 0$. 2
- d) Write particular integral of $P(D)y = e^{ax}$ if $P(a) = 0$. 2
- e) If y_1 and y_2 are linearly dependent differentiable functions then prove that their Wronskian vanishes identically. 2
- f) Find the Wronskian of $y_1(x) = \sin x, y_2(x) = \cos x$. 2
- g) Find order of a difference equation
 $y_{n+2} - 5y_{n+1} + 6y_n = 0$ 2
- h) Define operations Δ and E . 2
