B.Sc. (CBCS Pattern) Sem-II

USMT03 - Mathematics Paper-I : Ordinary Differential Equations and Difference Equations

P. Pages : 2 | GUG/W/22/11586

Time : Three Hours | Max. Marks : 60

* 2 2 3 5 *

Notes : 1. Solve all the **five** questions.
2. All question carries equal marks.

UNIT - I

1. a) Show that the differential equation $\left(e^{y}+1\right)\cos x\,dx+e^{y}\sin x\,dy=0$ is exact and solve it. **6**

b) Solve $\frac{dy}{dx}+\frac{y}{x}=x^{2}$, given y = 1 when x = 1. **6**

OR

c) Solve: $\cos x\,dy=y(\sin x-y)\,dx$ **6**

d) Find the orthogonal trajectories of the family of semi cubical parabolas. $ay^{2}=x^{3}$. **6**

UNIT - II

2. a) Solve: $y''-4y'+4y=e^{2x}+\sin 2x$. **6**

b) Solve: $\frac{d^{2}y}{dx^{2}}+3\frac{dy}{dx}+2y=e^{-5x}$. **6**

OR

c) Solve; $\left(D^{3}-7D-6\right)y=e^{2x}(1+x)$. **6**

d) Solve: $\frac{dx}{dt}+7x-y=0,\ \frac{dy}{dt}+2x+5y=0$. **6**

UNIT - III

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

b) Solve: $\left(x^{2}D^{2}-xD+4\right)y=\cos(\log x)$. **6**

OR

c) Prove that any two linearly independent functions y_1 and y_2 satisfy the differential equation $u'' + \frac{y_2 y_1'' - y_1 y_2''}{W} u' + \frac{y_1' y_2'' - y_2' y_1''}{W} u = 0$ where $W = W(y_1, y_2, x)$. **6**

d) Find the particular solution of $y'' - 2y' + y = 2x$ by variation of parameters. **6**

UNIT - IV

4. a) From the equation $y_n = A \cdot 3^n + B \cdot 5^n$, derive a difference equation by eliminating arbitrary constant A and B. **6**

b) Solve: $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ given $u_0 = 0, u_1 = 1$. **6**

OR

c) Solve: $y_{n+2} - 2\cos\alpha \cdot y_{n+1} + y_n = \cos(\alpha n)$. **6**

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

5. Solve **any six.**

a) Find the integrating factor of the linear differential equation $\frac{dy}{dx} + \frac{2}{x} y = \sin x$. **2**

b) Solve the diffarential equation $p = \log(px - y)$, $p = \frac{dy}{dx}$. **2**

c) Solve: $(D-1)(D-2)(D-3)y = 0$, where $D = \frac{d}{dx}$. **2**

d) Solve: $y'' + 2y' + y = 0$. **2**

e) If y_1 and y_2 are linearly dependent differentiable functions then prove that their Wronskian vanishes identically. **2**

f) Define Wronskian $W(y_1, y_2, x)$. **2**

g) Solve: $y_{n+3} - 3y_{n+1} - 2y_n = 0$. **2**

h) Write the difference equation **2**
$\Delta^2 y_n - 3\Delta y_n + 2y_n = 0$
in E-form.

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