University of Information Technology & Sciences (UITS)

Faculty of Science and Engineering

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Term Final Examination, Spring-2024

Course Title: Ordinary and Partial Differential Equation

Course Code: MAT 165

Marks: 50 *Time: 3(three) Hours*

(Answer all the questions)

1. a) Define linear differential equation with constants coefficients. Evaluate the following non-homogeneous differential equation: **[05]**

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = 8\,sin3x$$

b) Determine the following system of linear differential equations : **[05]**

$$\left.\begin{aligned}\frac{dx}{dt} &= -2x + 7y\\ \frac{dy}{dt} &= 3x + 2y\end{aligned}\right\}$$

2. Write down the general form of the higher order Cauchy Euler equation and solve the following equation : **[10]**

$$x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 6y = x^3,\ y(1) = 1,\ y'(1) = -6.$$

3. a) Explain partial differential equation with example. Find the partial differential equation by eliminating constant from the following equation: **[03]**

$$z = axe^y + \frac{1}{2}a^2e^{2y} + b$$

b) Find the partial differential equation by eliminating of f and F from the following equation: **[03]**

$$z = f(x^2 - y) + F(x^2 + y)$$

c) Form a partial differential equation from the following equation: **[04]**

$$\varphi(x^2 + y^2 + z^2,\ z^2 - 2xy) = 0.$$

4. (a) Define the Lagrange's method. Solve the following partial differential equation: **[03]**

$$\frac{y^2z}{x}p + xzq = y^2$$

(b) Using multipliers to solve the following linear partial differential equations : **[07]**

(i) $(x+2z)\frac{\partial z}{\partial x}+(4zx-y)\frac{\partial z}{\partial y}=2x^2+y$

(ii) $x(y^2-z^2)\frac{\partial z}{\partial x}-y(z^2+x^2)\frac{\partial z}{\partial y}=z(x^2+y^2)$

5. Evaluate the following linear partial differential equations with constants coefficient: **[10]**

(i) $(D_x^3-4D_x^2D_y+4D_xD_y^2)z=\cos(x+5y)$

(ii) $(D_x^2+D_y^2)z=30(2x+y)$

(iii) $(4D_x^2-4D_xD_y+D_y^2)z=16\ln(x+2y)$

(iv) $(D_x^2+2D_xD_y+D_y^2)z=e^{2x+3y}$