

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, Autumn 2024

Course Title: Ordinary and Partial Differential Equation

Course Code: MATH 0541121

Marks: 50

Time: 3(three) hours

(Answer all questions)

Q.No.	Questions	Marks
1. a)	Define linear differential equation with constants coefficients? Evaluate the following non-homogeneous differential equation: $y'' - 4y' + 3y = 9x^2 + 4$	[06]
b)	Determine the following system of linear differential equations : $\frac{dx}{dt} = -2x + 7y$ $\frac{dy}{dt} = 3x + 2y$	[04]
2. a)	Find the orthogonal trajectory of the family of curves: $cx^2 + y^2 = 1$	[03]
b)	Write down the general form of the higher order Cauchy Euler equation and solve the following equation : $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = 4 \ln x$	[07]
3. a)	Explain partial differential equation with example. Find the partial differential equation by eliminating constant from: $z = Ae^{pt} \sin px$	[03]
b)	Find the partial differential equation by eliminating of f and F from: $z = f(x + iy) + F(x - iy)$	[03]
c)	Form a partial differential equation from: $\varphi(x + y + z, x^2 + y^2 - z^2) = 0.$	[04]
4. a)	What is Lagrange's method? Solve the following partial differential equation: $y^2 \frac{\partial z}{\partial x} - xy \frac{\partial z}{\partial y} = x$	[03]
b)	Using multipliers find the following linear partial differential equations: (i) $(y - zx) \frac{\partial z}{\partial x} + (x + yz) \frac{\partial z}{\partial y} = (x^2 + y^2)$ (ii) $x(y^2 - z^2) \frac{\partial z}{\partial x} - y(z^2 + x^2) \frac{\partial z}{\partial y} = z(x^2 + y^2)$	[07]

5.

Evaluate the following linear partial differential equations with constants [10]

coefficient:

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

(ii) $(2D_x^2 - 5D_xD_y + 2D_y^2)z = 24(y - x)$

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

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