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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-2023

Course Title: Ordinary & Partial Differential Equations

Course Code: MAT 165

Marks: 50

Time: 3 Hours

(Answer all questions)

1. a) Find the general solution of the following differential equations: [6]

(i) $y'' - 5y' + 6y = e^{2x}$

(ii) $y'' - 3y' + y = \cos 3x$.

- b) Solve the homogenous linear differential equation with constant coefficients: [4]

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 25y = 0, y(0) = 3, y'(0) = 5.$$

2. a) Write the general form of Cauchy Euler equation. [2]

- b) Solve the Cauchy Euler equation: [8]

$$x^2 \frac{d^2y}{dx^2} - 5x \frac{dy}{dx} + 8y = 2x^3, y(2) = 0, y'(2) = -8.$$

3. a) Form a partial differential equation by eliminating the arbitrary constants A and P from $z = Ae^{Pt} \sin(Px)$. [5]

- b) Form a partial differential equation by elimination of function φ from: [5]

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

4. Solve the following linear partial differential equations by Lagrange's method:

(i) $\left(\frac{y^2z}{x}\right) \frac{\partial z}{\partial x} + xz \frac{\partial z}{\partial y} = y^2$ [3]

(ii) $\frac{\partial z}{\partial x} - 2\frac{\partial z}{\partial y} = 3x^2 \sin(y + 2x)$ [3]

(iii) $x(y^2 + z) \frac{\partial z}{\partial x} - y(x^2 + z) \frac{\partial z}{\partial y} = z(x^2 - y^2)$ [4]

5.

Find the general solution of the following partial differential equations:

[10]

$$(i) \quad (D_x^3 - 4D_x^2D_y + 4D_xD_y^2)z = 6 \sin(3x + 2y)$$

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

$$(iii) \quad (D_x^2 + D_xD_y - 2D_y^2)z = (2x + y)^{1/2}$$