

5

**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(three) hours**

**(Answer all questions)**

1. Solve the following differential equations: [10]
  - (i)  $(D^3 - 4D^2D' + 4DD'^2)z = 0.$
  - (ii)  $(D^2 + 3DD' + 2D'^2)z = 2x + 3y.$
  - (iii)  $(D^2 - 2DD' + D'^2)z = e^{x+2y}.$
2. State the Cauchy Euler Equations. Solve the following Cauchy Euler Equations: [10]
$$x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 6y = 5x^3, \quad y(1) = -1, \quad y'(1) = -3.$$
3. a) Solve the following system of differential equations: [06]
$$\begin{cases} \frac{dx}{dt} = -6x + 2y \\ \frac{dy}{dt} = 2x - 2y \end{cases}$$
  - b) Define orthogonal trajectory. Find the orthogonal trajectories of the family of curves  $y = ax^2$ ,  $a$  being parameter of the family. [04]
4. a) Define partial differential equation. [01]
  - b) Find a partial differential equation by eliminating  $a, b, c$  from  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ . [04]
  - c) Form partial differential equations from the following functions [05]
$$\varphi(x + y + z, x^2 + y^2 + z^2) = 0.$$
5. Solve the following partial differential equations: [10]
  - (i)  $a(p + q) = z$
  - (ii)  $p \tan x + q \tan y = \tan z$
  - (iii)  $py + qx = xyz^2(x^2 - y^2)$