

EXAM: Final TERM: 2 COURSE TITLE: Ordinary Differential equations PROGRAM: Math. CS, GPhys. DATE: 10-6-2023

LEVEL: 2 s CODE: 208 M MARKS: 105 DURATION: 2h



## Marks Answer each of the following questions: Q1: (12 Marks) Classify each of the following equations according to *degree*, order, homogeneity, and linearity: 1. $\frac{y'''}{y'} + y = 0$ 4 2. $y'y'' - \sin y = 0$ 4 3. $(y'')^{1/3} + (y')^{1/2} = 0$ 4 Q2: (10 Marks) 1. Form a differential equation by eliminating the arbitrary constants A, B from 5 $y(x) = Ax^2 + Bx.$ 2. Find all possible values of the constant $\alpha$ so that the function $y(x) = e^{\alpha x}$ is a 5 solution of the equation $yy'' - (y')^2 = 0$ . Q3:(40 Marks) Find the general solution of each of the following equations: 1. $y' - \frac{2}{x}y = x$ 8 8 2. $y' = (x + y)^2$ 3. $y' = -\frac{1+x+y^2}{2xy+y}$ 8 4. $p^6 + p^4 + 2p - 4 = 0$ (p = y')8 5. $\cos y y' + x \sin y = x$ 8 Q4:(43 Marks) Solve each of the following equations: 1. y'' - 5y' + 6y = 0, y(0) = 1, y'(0) = 08 2. $x^2 v'' + v = 0$ 8 3. $v'' - 2v' - 3v = e^{3x}$ 9 4. $\frac{dx}{dt} - 2y = 0$ , $\frac{dy}{dt} + x = t$ (System) <u>9</u> 5. y'' + y = t, y(0) = y'(0) = 0 (Use Laplace transformation) 9 Hint: $\mathcal{L}{t} = \frac{1}{s^2}$ , $\mathcal{L}{sin bt} = \frac{b}{s^2 + b^2}$ , s > 0.

With my best wishes Professor Dr. Hassan El-Morshedy