



COMSATS University Islamabad (CUI)
Islamabad Campus
Midterm

Course: MTH 242 - Differential Equations
Level: BCT-7A, BAI-5A, BCS- 5(A & B)
Instructor: Dr. Qazi Muhammad Zaigham Zia
Dr. Zahoor Shah

April 17, 2025
Time Allowed: 90 minutes
Total Marks: 25

Instructions:

Answer ALL questions. Show all the work. Answers without explanations will get partial credits only.

Question No. 01:(2 + 2 marks)

- (i) Find values of m so that the function $y = e^{mx}$ is a solution of the given differential equation,

$$y'' - 5y' + 6y = 0.$$

- (ii) Determine the region of the xy -plane for which the differential equation,

$$(y - x)y' = y + x,$$

would have a unique solution.

Question No. 02:(4 marks) Find the value of k so that the differential equation,

$$(y^3 + kxy^4 - 2x)dx + (3xy^2 + 20x^2y^3)dy = 0,$$

is exact.

Question No. 03:(4 marks) Solve

$$xy^2 \frac{dy}{dx} = y^3 - x^3, \quad y(1) = 2.$$

Question No. 04: (5 marks) A dead body was found within a closed room of a house where the temperature was a constant 70° F. At the time of discovery the core temperature of the body was determined to be 85° F. One hour later a second measurement showed that the core temperature of the body was 80° F. Assume that the time of death corresponds to $t = 0$ and that the core temperature at that time was 98.6° F. Determine how many hours elapsed before the body was found.

Question No. 05:(4 marks) Determine whether the set of functions $\{1, \cos 2x, \cos^2 x\}$ is linearly independent on the interval $(-\infty, \infty)$.

Question No. 06:(4 marks) The function $y_1 = e^{5x}$ is a solution of differential equation $y'' - 25y = 0$. Determine the second independent solution using reduction of order.