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Daffodil International University

B. Sc. in Civil Engineering

Midterm Examination, Spring 2026

Course Code: MAT 203 | Course Title: Engineering Mathematics for Civil Engineers

Section: A, B, C | Level-Term: 2-2 | Teacher's Initial: SS

Full Marks: 25 | Date: February 26, 2026 | Time: 1.5 Hours

Note: There are three questions in total. Answer all of them. Assume any reasonable value if it is not provided. The figures in the right-hand margin indicate full marks.

1. Represent the following equation as ordinary differential equation. *[CO1, C2]* [03]

   a) $x^2 + y^2 + 2ax + 2by + c = 0$; (where a, b and c are arbitrary constant)

   b) $y = e^x(Acosx + Bsinx)$; (where A and B are arbitrary constant).

2. Identify the degree and order of the following differential equations. *[CO1, C2]* [02]

   a) $\left(\frac{d^2y}{dx^2}\right)^{\frac{1}{3}} = \left(y + \frac{dy}{dx}\right)^{\frac{1}{2}}$

   b) $y = \sqrt{x}\left(\frac{dy}{dx}\right) + k \Big/ \left(\frac{dy}{dx}\right)$

   c) $\frac{d^2y}{dx^2} = \left(1 + \frac{dy}{dx}\right)^{1/2}$

   d) $\left\{y + x\left(\frac{dy}{dx}\right)^2\right\}^{\frac{4}{3}} = x\left(\frac{d^2y}{dx^2}\right)$

3. Solve the following differential equations using any applicable method. *[CO2, C3]*

   a) $(D^4 - 4D^3 + 8D^2 - 8D + 4)y = 0$ [04]

   b) $sinx\left(\frac{dy}{dx}\right) + 3y = cosx$ [04]

   c) $\left(y + \frac{y^3}{3} + \frac{x^2}{2}\right)dx + \left(\frac{1}{4}\right)(x + xy^2)dy = 0$ [04]

   d) $(4y + 3x)dy + (y - 2x)dx = 0$ [04]

   e) $\frac{dy}{dx} = \frac{x(2logx + 1)}{siny + ycosy}$ [04]