

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) $y = e^x(A\cos x + B\sin x)$; (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) $y = \sqrt{x}\left(\frac{dy}{dx}\right) + k/\left(\frac{dy}{dx}\right)$

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) $\sin x \left(\frac{dy}{dx}\right) + 3y = \cos x$ [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) $\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y\cos y}$ [04]