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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Midterm Examination, Fall-2026

Course Code: 0541-121
Section: A, B, C, D, E, F
Full Marks: 25

Course Title: Ordinary and Partial Differential Equation
Level-Term: 11-12
Exam Date: Oct 31, 2026

Teacher's Initial: UM,SS
Time: 1.5 Hours

[Answer all the following questions]
[The second right-most column indicates the COs with the respective Bloom's level]
[The right-most column indicates the assigned marks]

Q1. (a) **Explain** Homogeneous differential equation. CO-1 [1]

(b) **Identify** the order, degree, and linearity or nonlinearity of the following differential equation with justification: (C2) [3]

i. $\frac{d^3y}{dx^3} = \sqrt[5]{\left(\frac{dy}{dx}\right)^2 + 5\frac{dy}{dx} + y}$

ii. $y'''.y''' + \sin y = x^5 y$

(c) **Express** $y = e^x(A\cos x + B\sin x)$ in the form of an ODE. [2]

Q2. **Solve** the following differential equations: CO-2 (C3) [3 × 4 = 12]

i. $\frac{dy}{dx} = \frac{y}{x} + \cos\frac{y}{x}$

ii. $\frac{dy}{dx} = \frac{6x-10y+3}{3x-5y+5}$

iii. $\cos x\, dy + (y\sin x - 1)\, dx = 0; \quad y(0) = 1$

Q3. (a) The variation of resistance, R ohms, of an aluminium conductor with temperature °C is given by $\frac{dR}{d\theta} = \alpha R$, where α is the temperature coefficient of resistance of aluminium. If $R = R_0$ when $\theta = 0$°C, **compute** the equation for R. CO-2 (C3) [3]

(b) An RC circuit has an emf of $300cos2t\ V$, a resistance of $150\ \Omega$, a capacitance of $\frac{1}{6} \times 10^{-2} F$, and an initial charge on the capacitor of $5\ C$. **Determine** [4]

i. the charge on the capacitor at any time t
ii. the steady-state current and
iii. the transient current.