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Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2025

Course Code: 0541-123
Section: A,B,C,D
Full Marks: 40

Course Title: Ordinary & Partial Differential Equation
Level-Term: L1-T2
Exam Date: December 17, 2025

Teacher's Initial: TRS, IJM
Time: 2 Hours

[Notes: Answer all the following questions
CO's represent one of the learning outcomes of the course.
Figures on the right hand side indicate marks allocated for the questions.]

Marks

Q1. **Apply** the suitable method to solve the following linear differential equations with constant coefficients: **CO-2 (C3)** **[8]**

i) $D^2(D^2 - 2D + 1)y = 0$
ii) $D^2y + 4Dy + 3y = e^{-2x}$

Q2. **Compute** the general solutions of the following differential equations **CO-2 (C3)** **[15]**

i) $(D^2 + 4)y = sin2xcos4x$
ii) $\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 8y = e^x sin2x$
iii) $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = x^2(lnx)^3$

Q3. **Apply** the appropriate method for solving first-order partial differential equation **CO-2 (C3)** **[4]**

$$xz(z^2 + xy)p - yz(z^2 + xy)q = x^4$$

for $z(x, y)$, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$.

Q4. Consider a series RLC circuit with resistance R, inductance L and capacitance C. The charge $q(t)$ on the capacitor satisfies the homogeneous second-order differential equation: **CO-3 (C3)** **[6]**

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{1}{C}q = 0$$

where $L = 1H$, $R = 2\Omega$, $C = \frac{1}{5}F$, initial charge $q(0) = 5C$ and $q'(0) = 0$. **Solve** the differential equation for $q(t)$.

Q5. **Solve** the initial-value problem by applying the method for linear homogeneous differential equations with constant coefficients: **CO-3 (C3)** **[7]**

$$y'' + 2y' + 2y = 0, \qquad y(0) = 0, \qquad y'(0) = 1$$