Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Spring-2026

Course Code: 0541-123 | Course Title: Ordinary and Partial Differential Equation
Section: A, B, C, D, E, F, G | Level-Term: L1-T2 | Teacher's Initial: SDN, IJM, TRS
Full Marks: 40 | Exam Date: May 02, 2026 | Time: 2 Hours

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

Q1. (a) **Describe** different types of higher-order linear ordinary differential equations. 3
(b) **Explain** the initial and boundary value problems. CO-1 2
(c) **Convert** the equation $z = A\, e^{-p^2 t} cospx$ into a partial differential equation by eliminating the constants. C(2) 3

Q2. **Solve** the following partial differential equations
(i) $(D^3 - 4D'D^2 + 4DD'^2)z = \cos(2x + 3y)$, where $D \equiv \frac{\partial}{\partial x}$ and $D' \equiv \frac{\partial}{\partial y}$. CO-2 8
(ii) $xyp + y^2 q = zxy - 2x^2$, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$. C(3)

Q3. (a) **Solve** the following ordinary differential equations 8
(i) $D^3 y - 2Dy + 4y = e^x \cos x$.
(ii) $x^2 \frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = 0$. CO-2
C(3)
(b) **Solve** the differential equation $\frac{d^2y}{dx^2} + 4y = \sin^2 2x$ with the initial condition $y(0) = 0$ and $y'(0) = 0$. 5

Q4. (a) An RCL circuit connected in series has $R = 180$ ohms, $C = 1/280$ farad, $L = 20$ henries, and an applied voltage $E(t) = 10\sin t$. Assuming no initial charge on the capacitor, but an initial current of 1 ampere at $t = 0$ when the voltage is first applied, **compute** the subsequent charge on the capacitor at $t = \pi$ s. 5
CO-3
C(3)
(b) A flexible string of length π is stretched tightly between two fixed points at $x = 0$ and $x = \pi$. The vertical displacement of the string at position x and time t is denoted by $\frac{\partial^2 u(x,t)}{\partial x^2} = \frac{1}{K^2}\frac{\partial^2 u(x,t)}{\partial t^2}$. **Solve** the system using the method of separation of variables. 6

$2\sin^2 A$
$1 - \cos 2A$