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Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering

Final Examination, Summer-2026

Course Code: 0541-121 | Course Title: Ordinary and Partial Differential Equation
Section: A, B | Level-Term: L1-T2 | Teacher's Initial: IJM
Full Marks: 40 | Exam Date: 19th August, 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** i) Cauchy-Euler equation & ii) PDE; with examples — CO-1 C(2) — 3 4

(b) **Convert** the equation $z = axe^y + \frac{1}{2}a^2e^{2y} + b$ into a partial differential equation by eliminating the constants a & b.

Q2. (a) **Solve** the Partial differential equations: — CO-2 C(3) — 8

i) $(D^2 + 2DD' + D'^2)Z = e^{(2x+3y)}$

ii) $p + 3q - 5z + \tan(y-3x)$ *where,* $p = \frac{dz}{dx}, q = \frac{dz}{dy}$

Q3. (a) **Solve** the following ordinary differential equations — CO-2 C(3) — 12

(i) $D^3y + y = (e^x + 1)^2$

ii) $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$

iii) $\frac{d^2y}{d\theta^2} + y = 0$, *with initial condition* $y(\frac{\pi}{3}) = 0, y'\left(\frac{\pi}{3}\right) = 2$

Q4. (a) A series L–R–C circuit is connected to a DC voltage source of E(t)=150 V. The circuit has inductance L=0.5 H, resistance R=20Ω, and capacitance C=0.01 F. Initially, the charge on the capacitor is q(0) =1C and the current is i(0)= 0 A. — CO-3 C(3) — 6

i) Develop the governing differential equation for the charge q(t) in the circuit.
ii) Determine the current i(t) in the circuit.
iii) Calculate the steady-state charge on the capacitor after a sufficiently long time

(b) Let $u(x,t)$ represents temperature of a thin rod of length π, which is placed on the interval $\{x: 0 \le x \le \pi\}$, at position x and time t. The PDE that governs the heat distribution is given by — 7

$$\frac{d^2u}{dx^2} = \frac{1}{k}\frac{du}{dt}$$

Solve the system using the method of separation of variables.