



Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Summer-2026

Course Code: 0541-121

Section: A, B

Full Marks: 40

Course Title: Ordinary and Partial Differential Equation

Level-Term: L1-T2

Exam Date: 19th August, 2026

Teacher's Initial: IJM

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 3
C(2) 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 8
 i) $(D^2 + 2DD' + D'^2)Z = e^{(2x+3y)}$ C(3)
 ii) $p + 3q = 5z + \tan(y-3x)$ where, $p = \frac{dz}{dx}$, $q = \frac{dz}{dy}$
- Q3. (a) **Solve** the following ordinary differential equations 12
 (i) $D^3y + y = (e^x + 1)^2$
 ii) $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 2x^2$ CO-2
C(3)
 iii) $\frac{d^2y}{d\theta^2} + y = 0$, with initial condition $y(\frac{\pi}{3}) = 0, y'(\frac{\pi}{3}) = 2$
- 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 $R=20\Omega$, and capacitance $C=0.01$ F. Initially, the charge on the capacitor is $q(0)=1$ C and the current is $i(0)=0$ A. 6
 i) **Develop** the governing differential equation for the charge $q(t)$ in the circuit. CO-3
 ii) **Determine** the current $i(t)$ in the circuit. C(3)
 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 $\{x: 0 \leq x \leq \pi\}$, 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.