



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Fall – 2025

Course Code: 0541-111

Course Title: Differential and Integral Calculus

Section: A, B, C, D, E, F, G, H

Level-Term: L1-T1

Teacher's Initial: SDN, HRP, TRS

Full Marks: 25

Exam Date: October 08, 2025

Time: 1.5 Hours

[Answer all the following questions sequentially]

Q1. (a) Explain Limit of a function.

CO-1 [2]

(b) Identify the value of k for which the function

(C2)

$$f(x) = \begin{cases} 7x - 2, & x \leq 1 \\ kx^2 & x > 1 \end{cases}$$

CO-1 [4]

(C2)

is continuous at $x = 1$. Also, express the function $f(x)$ approximately in a graph.Q2. (a) Calculate $\frac{dy}{dx}$ for the following functions:

CO-2 [4]

(C3)

(i) $y = \sqrt{1+x^4} \ln(\cos^2 x) + x^{\tan^{-1} x}$

(ii) $y = \frac{x^3+2x^2-1}{x+5}$

(b) The parametric equations of a prolate cycloid are

CO-2 [2]

(C3)

$$x = 2 - \pi \cos t, y = 2t - \pi \sin t, \quad -\pi \leq t \leq \pi$$

Calculate the value of $\frac{dy}{dx}$ at $t = \frac{\pi}{2}$.(c) For $y = e^{m \cos^{-1} x}$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$ using the Leibnitz theorem.

CO-2 [5]

(C3)

Q3. (a) The output voltage of a temperature sensor is given by $V(T) = 0.001T^2 + 0.5T + 1$.

CO-3 [4]

Using the mean value theorem, compute the temperature T at which the average rate of change of the sensor voltage occurs over the interval $[20, 80]^\circ\text{C}$.

(C3)

(b) An electrical voltage E is given by $E = (5 \sin 2\pi t + 15 \cos 2\pi t)$ volts, where t is the time in seconds. Compute the time at which the maximum voltage occurs and the value of the maximum voltage.

CO-3 [4]

(C3)