

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI
FSCS (CS & IT) , MIDTERM EXAMINATION - SPRING SEMESTER 2024

Time: 90 minutes

Dated: 22-05-2024

Max. Marks: 20

MT-171 DIFFERENTIAL & INTEGRAL CALCULUS (PAPER A)

Instructions: Attempt all questions. All questions carry equal marks.

QUESTION 1

CLO-1

4 marks

Evaluate (a) $\lim_{x \rightarrow \pi/4} (1 - \tan x) \sec 2x$

(b) $\lim_{x \rightarrow +\infty} \frac{x^{-4/3}}{\sin(\frac{1}{x})}$

QUESTION 2

CLO-1

4 marks

Use Leibnitz Theorem to determine the 5th order derivative of function $f(x) = x^4 \sin 2x$

QUESTION 3

CLO 2

4 marks

In a resort, a hotel room rent \$100 a night for the first three nights, \$ A a night for next three nights and \$ B a night for each remaining nights. The total rent T is a function of number of nights x that a guest stays. The piecewise function defined T as

$$T(x) = \begin{cases} 100x & , \quad 1 \leq x \leq 3 \\ Ax + 30 & , \quad 3 < x \leq 6 \\ Bx + 90 & , \quad x > 6 \end{cases}$$

- (a) For what values of A and B , the function becomes continuous.
(b) How much amount a guest has to be paid if he spent 5 days at resort?

QUESTION 4

CLO-2

8 marks

Use the following steps to **sketch** the function $f(x) = \frac{8}{x^2-4}$

- (a) Locate the x-intercept and y-intercept. (b) Identify asymptote does function have, if any.
(c) Calculate first derivatives and find stationary points. (d) Determine the intervals where f is increasing and decreasing.
(e) Calculate second derivative and find where the function is concave up and concave down.
(f) Locate the relative maximum and minimum values of the function. (g) Sketch the graph of $f(x)$.