National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Numerical Computing	Course Code:	CS2008
Degree Program:	BS (CS)	Semester:	Fall 2021
Exam Duration:	60 Minutes	Total Marks:	45
Paper Date:	October 20, 2021	Weight	15%
Section:	ALL	Page(s):	1
Exam Type:	Mid Term-I		

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Instruction/Notes: Attempt all questions on the answer book. Programmable calculators are not allowed. Don't write anything on a question paper except your name and roll number.

Q1. The area τ of a circle of diameter ω is given for the following values **Points (15)**

ω	80	85	90
τ	5026	5674	6362

Use best suitable interpolation formula to calculate the area of a circle having diameter 95. Also, find local numerical maximum / minimum (if any).

Q2. For a function $f[x]$, divided differences are given by **Points (15)**

$x_0 = 0.0$ $\quad f[x_0] = ?$ $\quad \Delta f_0$ 5

$f[x_0, x_1] = ?$

$x_1 = 0.4$ $\quad f[x_1] = ?$ 3 $\quad \Delta f_1$ $\quad f[x_0, x_1, x_2] = \frac{50}{7}$

$f[x_1, x_2] = 10$

$x_2 = 0.7$ $\quad f[x_2] = 6$

Determine the missing entries in the above Table and then find $f[0.2]$.

Note: Show your working steps on the answer book.

Q3. Derive (show step by step derivation) numerical differentiation formula based on Newton's forward difference interpolation. Also, use data given in Q1 to find $\frac{d\tau}{d\omega}$ at $\omega = 82.5$. **Points (15)**

Hint: Chain rule.

40.5