Varendra University

Department of Computer Science and Engineering
4th Semester (Summer-2025)
Course Code: CSE2205
Course Title: Numerical Methods

All the questions correspond to CO2, PO3, WK5

Assignment Topics:
Apply appropriate function approximation methods, including linear, polynomial, and interpolation techniques, to solve real-world data-based problems.

Instructions:

- Don't copy others if found marks will be deducted from the both scripts.
- Answer all the following questions in detail.
- Use appropriate diagrams if necessary.
- **Submission format**: Handwritten.
- **Deadline:** 16th November, 2025

Total marks: 10

An ice cream shop wants to predict daily temperature to prepare stock for next week. They recorded temperatures at noon over the past week. The goal is to estimate sales and avoid spoilage by predicting the temperature trend.

Day (x)	Temperature f(x) (^{0}C)
1	20
2	21
3	23
5	24
6	26
7	29

a)	Apply a linear least squares method to model temperature as a function of the day. Use the model to predict temperature for day 4 and explain how this prediction could help the shop plan ice cream stock.	3
b)	Fit a quadratic (degree 2) polynomial least squares model to the given dataset and use it to predict temperatures for day 4.	3
c)	A small town records daily river water levels (in meters) at four key locations along the river to help plan irrigation and prevent flooding. The measurements are taken at specific distances from the river source. Derive the necessary equations to fit a quadratic spline to this water level data. Set up the problem as a linear system $A\vec{x} = \vec{b}$ where the unknowns are the spline coefficients.	4

$Distance from\ source\ x(km)$	3.0	4.5	7.0	9.0
$Water\ level\ f(x)(m)$	2.5	1.0	2.5	0.5