CSE2202: Numerical Methods Lab

Online 5 A1

Problem Description:

The saturation concentration of dissolved oxygen in water as a function of temperature and chloride concentration is listed in Table 1.

T_degC temperature in degree Celsius	Dissolved Oxygen (mg/L) for temperature (degree Celsius) and concentration of chloride C = 10 g/L
0	12.9
5	11.3
10	10.1
15	9.03
20	8.17
25	7.46
30	6.85

1. Write a program that fit 4^{th} degree Lagrange Interpolating Polynomial and use the interpolating polynomial to find the relationship between temperatures and dissolved oxygen level using Lagrange Interpolating formula. Print a table of dissolved oxygen level for the temperature 40 to 70 degree Celsius in step size of 5 and also calculate Mean Squared Error (MSE) for data size 7. (8)

T_degC temperature in degree Celsius	Dissolved Oxygen (mg/L) for temperature (degree Celsius) and concentration of chloride C = 10 g/L
40	
45	
50	
55	
60	
65	
70	

2. Write a program that fit 3^{rd} degree Newton Divide Difference Interpolating Polynomial and use the interpolating polynomial to find the relationship between temperatures and dissolved oxygen level using Newton Divide Difference Interpolating formula. Print a table

of dissolved oxygen level for the temperature 40 to 70 degree Celsius in step size of 5. Also calculate Mean Squared Error (MSE) for data size 7 and coefficient of the polynomials. (10)

T_degC temperature in degree Celsius	Dissolved Oxygen (mg/L) for temperature (degree Celsius) and concentration of chloride C = 10 g/L
40	
45	
50	
55	
60	
65	
70	

Function	Value
Mean Squared Error (MSE)	
A0	
A1	
A2	
A3	

Equation for calculating MSE:

$$MSE = \frac{1}{n}\sum_{i=0}^{n}(y_i - \tilde{y_i})^2$$

$$n = size\ of\ the\ data$$

$$y_i = dissolved\ oxygen\ level\ of\ given\ data$$

$$\tilde{y_i} = dissolved\ oxygen\ level\ of\ predicted\ data$$