S_4 (UCE04B03), CE

B. Tech 4th Semester Endterm Examination 2021
Data Structures and Numerical Methods
UCE04B03

Full Marks: 50 **Time: 2.0 Hours**

Answer question (1) and any four from the rest.

1) a) Write a C program that asks the user to enter a matrix A of size $m \times n$ and a scalar α as inputs while the output is the multiplication of α and A.

b) Write a C program that asks the user to enter any integer as input and demonstrates whether the entered integer is an even or odd number.

c) Write a C program that calculates the summation of the series: $0+1+1+2+3+5+\ldots+$ up to n^{th} term. In this series, any term is a summation of the previous two terms. The user will enter n as input.

3+3+4=10

2) a) Write down different classifications of data structure.

b) An experiment on the life of a cutting tools at different speeds has given the following values:

Speed V ft/min. :	350	400	500	600
Life t min. :	61	26	7	2.6

Find out the best values of a and b in the law $V=ae^{bt}$ by the method of 'Least squares' regression.

4+6=10

3) a) Solve the following equations using the gauss-Seidel method: $27x+6y-z=85; 6x+15y+2z=72$ and $x+y+54z=110$

b) Differentiate between the linear and non-linear data structure.

c) Mention different types of operations performed on data structure.

4+3+3=10

4) Evaluate $I=\int_0^6 \frac{dx}{(1+x^2)}$ by using

a) Trapezoidal rule, by taking h=1.2

b) Simpson's 1/3 rule, by taking h=1

5+5=10

5) a) Evaluate $I=\int_0^4 xe^{2x}dx$ by using the two-point Gauss quadrature technique with the following Gauss points and corresponding weighting factors: $\xi_1=-0.577350$, $\xi_2=+0.577350$ and $w_1=w_2=1.000000$

b) Find out y at $x=1.0$ by solving the initial value problem $y'=-2xy^2$ with initial condition $y(0)=1$ using the fourth order Runge-Kutta method taking a step length $\Delta x=0.2$.

5+5=10

6) a) Apply Euler's method to the differential equation, $\frac{dy}{dx}=\frac{y-x}{y+x}$ with initial condition $y(0)=1$, to compute the approximate value $y(0.08)$ by considering a step length $\Delta x=0.04$.

b) Apply the modified Euler's method to solve the differential equation presented in part (a) by considering $\epsilon=1\times e^{-3}$.

4+6=10