Enrollment No: ______________________ Exam Seat No: ______________________

C. U. SHAH UNIVERSITY

Winter Examination-2019

Subject Name : Computer Oriented Numerical Methods

Subject Code : 4CS02ICN2 **Branch: B.Sc.I.T.**

Semester : 2 **Date : 12/09/2019** **Time : 02:30 To 05:30** **Marks : 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) The Gauss elimination method in which the set of equations are transformed into triangular form.
(A) True (B) False

b) It is not necessary to check condition for convergence at the time of solving linear systems by Gauss – Jacobi and Gauss – Seidel method.
(A) True (B) False

c) Jacobi iteration method can be used to solve a system of non – linear equations.
(A) True (B) False

d) The order of convergence in Newton-Raphson method is
(A) 2 (B) 3 (C) 0 (D) none of these

e) The order of convergence in Bisection method is
(A) zero (B) linear (C) quadratic (D) none of these

f) The method of false position has _____ convergence than the bisection method.
(A) faster (B) lower (C) equal (D) None of these

g) The Bisection method for finding the root of an equation $f(x)$ is
(A) $x_{n+1} = \frac{1}{2}(x_n + x_{n-1})$ (B) $x_{n+1} = \frac{1}{2}(x_n - x_{n-1})$
(C) $x_{n+1} = (x_n + x_{n-1})$ (D) None of these

h) Putting $n = 2$ in the Newton – Cote's quadrature formula following rule is obtained
(A) Simpson's $\frac{1}{3}$ rule (B) Trapezoidal rule (C) Simpson's $\frac{3}{8}$ rule
(D) none of these

i) While evaluating a definite integral by Trapezoidal rule, the accuracy can be increased by taking
(A) large number of sub – intervals (B) small number of sub – intervals
(C) odd number of sub – intervals (D) none of these

j) The value of $\int_0^1 \frac{dx}{1+x}$ by Simpson's $\frac{1}{3}$ rule is

(A) 0.9631 (B) 0.6391 (C) 0.6931 (D) 0.6935

k) Newton's forward interpolation formula is

(A) $y_p = y_n + p\nabla y_n + \frac{p(p+1)}{2!}\nabla^2 y_n + ...$

(B) $y_p = y_0 + p\Delta y_0 + \frac{p(p-1)}{2!}\Delta^2 y_0 + ...$

(C) $y = \frac{(x-x_1)(x-x_2).....(x-x_n)}{(x_0-x_1)(x_0-x_2).....(x_0-x_n)}y_0 + \frac{(x-x_0)(x-x_2).....(x-x_n)}{(x_1-x_0)(x_1-x_2).....(x_1-x_n)}y_1 + ... + \frac{(x-x_0)(x-x_1).....(x-x_{n-1})}{(x_n-x_0)(x_n-x_1).....(x_n-x_{n-1})}y_n$

(D) None of these

l) Lagrange's interpolation formula is

(A) $y_p = y_n + p\nabla y_n + \frac{p(p+1)}{2!}\nabla^2 y_n + ...$

(B) $y_p = y_0 + p\Delta y_0 + \frac{p(p-1)}{2!}\Delta^2 y_0 + ...$

(C) $y = \frac{(x-x_1)(x-x_2).....(x-x_n)}{(x_0-x_1)(x_0-x_2).....(x_0-x_n)}y_0 + \frac{(x-x_0)(x-x_2).....(x-x_n)}{(x_1-x_0)(x_1-x_2).....(x_1-x_n)}y_1 + ... + \frac{(x-x_0)(x-x_1).....(x-x_{n-1})}{(x_n-x_0)(x_n-x_1).....(x_n-x_{n-1})}y_n$

(D) None of these

m) _______________ is the best for solving initial value problems:

(A) Taylor's series method (B) Euler's method

(C) Runge-Kutta method of 4thorder (D) Modified Euler's method

n) Using modified Euler's method, the value of $y(0.1)$ for $\frac{dy}{dx} = x - y,$ $y(0) = 1$ is

(A) 0.809 (B) 0.909 (C) 0.0809 (D) none of these

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) Solve the following system of equations by Gauss-Seidal method. **(5)**

$6x + y + z = 105,\ 4x + 8y + 3z = 155,\ 5x + 4y - 10z = 65$

b) Given the table of values as **(5)**

x	2.5	3.0	3.5	4.0	4.5
$y(x)$	9.75	12.45	15.70	19.52	23.75

Find $y(4.25)$ using backward difference formula.

c) Evaluate $\sqrt{12}$ correct to three decimal places using Newton-Raphson method. **(4)**

Q-3 **Attempt all questions** **(14)**

a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's 3/8 Rule using $h = \frac{1}{6}$. **(5)**

b) The following table gives the values of x and y: **(5)**

x	30	35	40	45	50

y	15.9	14.9	14.1	13.3	12.5

Find the value of x corresponding to $y = 13.6$ using Lagrange's inverse interpolation formula.

c) Solve the following system of equations by Gauss Elimination Method: **(4)**
$2x_1 + 3x_2 + 5x_3 = 23,\ 3x_1 + 4x_2 + x_3 = 14,\ 6x_1 + 7x_2 + 2x_3 = 26$

Q-4 **Attempt all questions** **(14)**

a) Write a program to find the transpose of the matrix in C language. **(5)**

b) Using Newton's forward interpolation formula, find the value of $y(2.35)$ if **(5)**

x	2.00	2.25	2.50	2.75	3.00
$f(x)$	9.00	10.06	11.25	12.56	14.00

c) Find the positive root of the equation $x^3 - 5x + 3 = 0$ to three decimal positions using Secant method. **(4)**

Q-5 **Attempt all questions** **(14)**

a) Given that one root of the non-linear equation $x^3 - 4x - 9 = 0$ lies between 2.625 and 2.75. Find the root correct to four significant digits using bisection method. **(5)**

b) Solve the following system of equations using Gauss-Jordan method: **(5)**
$5x - 2y + 3z = 18,\ x + 7y - 3z = -22,\ 2x - y + 6z = 22$

c) Evaluate $\int_1^2 e^{-\frac{x}{2}}\, dx$ using Trapezoidal rule considering four intervals. **(4)**

Q-6 **Attempt all questions** **(14)**

a) Evaluate $\int_0^{0.6} e^{-x^2}\, dx$ by using Simpson's 1/3rd rule. **(5)**

b) Write a program to find the trace of the matrix in C language. **(5)**

c) Compute $f(9.2)$ by using Lagrange Interpolation formula from the following data: **(4)**

x	9	9.5	11
y	2.1972	2.2513	2.3979

Q-7 **Attempt all questions** **(14)**

a) Compute the real root of $x\log_{10} x - 1.2 = 0$ correct to four decimal places using False position method. **(5)**

b) Solve $\frac{dy}{dx} = x + y$ with $y(0) = 1$ by Euler's method for $x = 0.1$ correct to four decimal places by taking $h = 0.05$. **(5)**

c) Write a program to find the adjoint of the matrix in C language. **(4)**

Q-8 **Attempt all questions** **(14)**

a) Use the fourth – order Runge Kutta method to solve **(7)**
$\frac{dy}{dx} = y - \frac{2x}{y};\quad y(0) = 1$. Evaluate the value of y when x = 0.2 and 0.4.

b) Use Runge-kutta second order method to find the approximate value of $y(0.2)$ given that $\frac{dy}{dx} = x - y^2$ and $y(0) = 1$ and $h = 0.1$. **(7)**