Enrollment No: ______________________ **Exam Seat No:**______________________

C. U. SHAH UNIVERSITY

Winter Examination-2019

Subject Name : Computer Oriented Numerical Methods

Subject Code : 4CS02ICO1 **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) 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

b) The Gauss – Jordan method in which the set of equations are transformed into diagonal matrix form.
(A) True (B) False

c) Newton backward interpolation formula is used mainly to interpolate the values of function $f(x)$ near the middle of a tabular value.
(A) True (B) False

d) 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

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

f) In application of Simpson's $\frac{1}{3}$ rule, the interval of integration for closer approximation should be
(A) odd and small (B) even and small (C) even and large
(D) none of these

g) 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

h) In a lattice, if $a \le b$ and $c \le d$, then
(A) $b \le c$ (B) $a \le d$ (C) $a \vee c \le b \vee d$ (D) None of these

i) A self-complemented, distributive lattice is called
(A) Boolean Algebra (B) Modular lattice (C) Complete lattice
(D) Self-dual lattice

j) A connected graph T without any cycles is called ....
(A) free graph (B) no cycle graph (C) non cycle graph
(D) circular graph

k) Which of the following statement is true:
(A) Every graph is not its own sub graph.
(B) The terminal vertex of a graph are of degree two.
(C) A tree with n vertices has n edges.
(D) A single vertex in graph G is a sub graph of G.

l) Which of the following are posets?
(i) $(Z, =)$ (ii) $(Z, \neq)$ (iii) $(Z, >)$ (iv) $(Z, \geq)$
(A) (i) and (iv) (B) (i) and (ii) (C) (ii) and (iv) (D) (iii) and (iv)

m) A partial order relation is reflexive, transitive and
(A) antisymmetric (B) bisymmetric (C) antireflexive
(D) asymmetric

n) Different partially ordered sets may be represented by the same hasse diagram if they are same.
(A) same (B) lattice with same order (C) isomorphic
(D) order isomorphic

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

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

a) One real root of the equation $x^3 - 4x - 9 = 0$ lies between 2.625 and 2.75. Find the root using Bisection method. **(5)**

b) Find all the minterms of a Boolean Algebra with three variables x_1, x_2, x_3. **(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-3 **Attempt all questions** **(14)**

a) Consider following tabular values **(5)**

x	50	100	150	200	250
y	618	724	805	906	1032

Using Newton's Backward difference interpolation formula determine $y(300)$.

b) From the following adjacency matrix, find the out degree and in degree of each node. Also verify your answer by drawing digraph and its adjacency matrix. **(5)**

$$\begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{array}{c} \begin{array}{cccc} v_1 & v_2 & v_3 & v_4 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

c) Solve the following system of equations by Gauss Elimination Method: **(4)**

$-x_1+x_2+2x_3=2,\ 3x_1-x_2+x_3=6,\ -x_1+3x_2+4x_3=4$

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

a) Solve the following system of equations by Gauss-Seidal method. **(5)**
$30x-2y+3z=75,\ 2x+2y+18z=30,\ x+17y-2z=48$

b) Draw the graph of tree represented by **(5)**
$\left(v_0\ \left(v_1\ (v_2)\ \left(v_3\ (v_4)\ (v_5)\right)\right)\ \left(v_6\ \left(v_7\,(v_8)\right)\ (v_9)\ (v_{10})\right)\right)$

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

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

a) Show that $\langle \{1,\ 2,\ 3,\ 6\},\ \text{GCD, LCM} \rangle$ is a sublattice of the lattice $\langle S_{30},\ \text{GCD, LCM}\rangle$. **(5)**

b) Evaluate $\int_0^1 x^3\ dx$ using Simpson's 1/3rd rule. **(5)**

c) Draw all non-isomorphic graph on 2 and 3 vertices. **(4)**

Q-6 **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)**

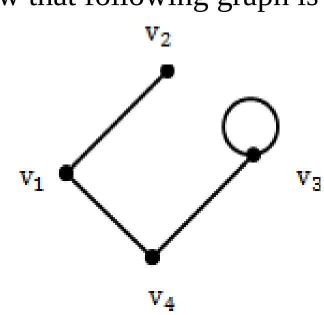
b) Show that the following Boolean expression are equivalent. **(5)**
(i) $(x\oplus y)*(x'\oplus y),\ y$
(ii) $x*\left(y\oplus\left(y'*(y\oplus y')\right)\right),\ x$
(iii) $(z'\oplus x)*\left((x*y)\oplus z\right)*(z'\oplus y),\ x*y$

c) Find Join-irreducible elements and atoms for the lattice $\langle S_4\times S_9,\ \text{D}\rangle$. **(4)**

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

a) Use Euler's method to find an approximate value of y at $x=0.1$, in five steps, given that $\frac{dy}{dx}=x-y^2$ and $y(0)=1$. **(5)**

b) Show that following graph is connected. **(5)**



c) Draw the graph where $\text{V}=\{1,2,3,4\}$ and $\text{E}=\{e_1,e_2,e_3,e_4,e_5\}$, **(4)**
$e_1=e_5=(1,2)$, $e_2=(4,3)$, $e_4=(2,4)$ and $e_3=(1,3)$.

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

a) Apply Runge-Kutta fourth order method, to find an approximate value of y when $x=0.2$, given that $\frac{dy}{dx}=x+y$ and $y=1$ when $x=0$. **(5)**

b) Draw Hasse diagram for the poset $\langle S_{24},\ \mathbf{D}\rangle$; where $a\mathbf{D}b$ means a divides **(5)**

b.

c) If Ø is the set of all positive integers and relation D on Ø defined by $a,\ b\ \in □$, $a\mathbf{D}b$ if "*a* divides *b*" then show that $\langle □,\ \mathbf{D}\rangle$ is a poset. **(4)**