Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Computer Oriented Numerical Methods

Subject Code : 4CS02ICO1 **Branch: B.Sc.I.T.**

Semester : 2 **Date : 20/04/2019** **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) The convergence in the Gauss – Seidel method is faster than Gauss – Jacobi method.
(A) True (B) False

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

e) Iterative formula for finding the square root of N by Newton-Raphson method is

(A) $x_{i+1} = \frac{1}{2}\left(x_i - \frac{N}{x_i} \right) \ (i = 0,1,2,.....)$

(B) $x_{i+!} = \frac{1}{2}\left(x_i + \frac{N}{x_i} \right) \ (i = 0,1,2,.....)$

(C) $x_{i+1} = x_i (2 - N x_i) \ (i = 0,1,2,.....)$ (D) None of these

f) The number of strips required in Simpson's $3/8^{th}$ rule is a multiple of
(A) 1 (B) 2 (C) 3 (D) 6

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) A self-complemented, distributive lattice is called
(A) Boolean algebra (B) Modular lattice (C) Bounded lattice

(D) Complete lattice

i) If B is a Boolean Algebra, then which of the following is true
(A) B is a finite but not complemented lattice.
(B) B is a finite, complemented and distributive lattice
(C) B is a finite, distributive but not complemented lattice.
(D) B is not distributive lattice.

j) A graph with one vertex and no edges is:
(A) multigraph (B) digraph (C) isolated graph (D) trivial graph

k) A graph is tree if and only if
(A) Is planar (B) Contains a circuit (C) Is minimally
(D) Is completely connected

l) A non-empty finite poset is
(A) at most one greatest element (B) at most one least element
(C) either (A) or (B) (D) both (A) and (B)

m) A relation that is reflexive, anti-symmetric and transitive is a
(A) function (B) equivalence relation (C) partial order
(D) None of these

n) Hasse diagram are drawn for
(A) Partially ordered sets (B) Lattices (C) Boolean algebra
(D) none of these

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

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

a) One real root of the equation $e^{-x} - x = 0$ lies between 0 and 1. Find the root using Bisection method. **(5)**

b) Find all the maxterms of a Boolean Algebra with three variables x_1, x_2, x_3. **(5)**

c) Given the table of values as **(4)**

x	0	1	2	3
$y(x)$	0	2	8	27

Find $y(2.5)$ using Lagrange's Interpolation formula.

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

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

x	2.0	2.25	2.50	2.75	3.0
$y(x)$	9.00	10.06	11.25	12.56	14.00

Find $y(2.35)$ using Newton's forward difference formula.

b) Find indegree and outdegree of each node from the following adjacency matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ and draw its digraph. **(5)**

c) Solve the following system of equations by Gauss Elimination Method: **(4)**
$5x - 2y + 3z = 18,\ x + 7y - 3z = -22,\ 2x - y + 6z = 22$

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

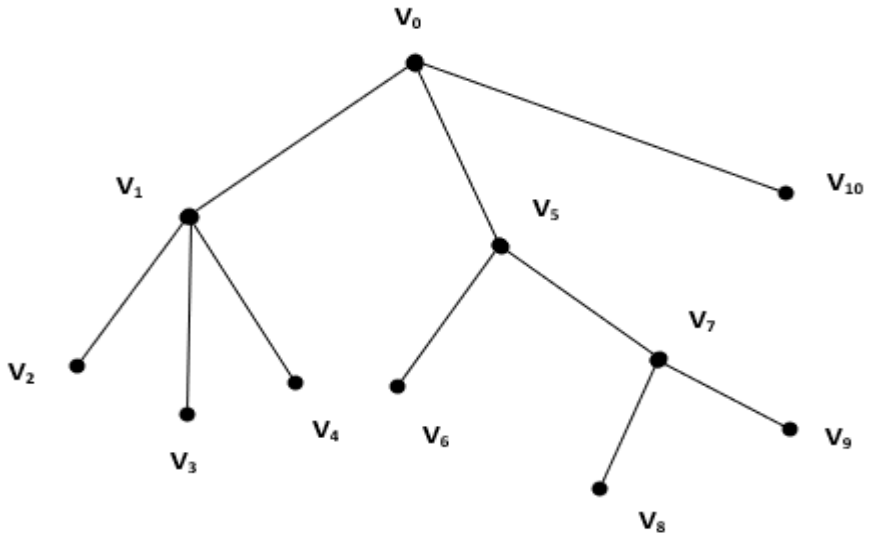
a) Solve the following system of equations by Gauss-Seidal method. **(5)**
$10x_1 + x_2 + 2x_3 = 44,\ 2x_1 + 10x_2 + x_3 = 51,\ x_1 + 2x_2 + 10x_3 = 61$

b) For the following tree **(5)**

(i) Give all the leaf and branch nodes.

(ii) Give all the sub-tree with roots which are nodes at level 1.

(iii) Degree of nodes v_0, v_5, v_7.



c) Using Newton-Raphson method, find the root the equation **(4)**
$f(x) = \sin x + \cos x$.

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

a) Using definition of complement of an element find complement of each element of lattice $\langle S_{10},\ \text{GCD, LCM, 1, 10}\rangle$ **(5)**

b) Use Trapezoidal rule to evaluate $\int_0^1 x^3\ dx$ considering five sub-intervals. **(5)**

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

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

a) Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2}\ dx$ by taking seven ordinates. **(5)**

b) Write the following Boolean expressions in an equivalent sum of products canonical form in three variables x_1, x_2, x_3. **(5)**

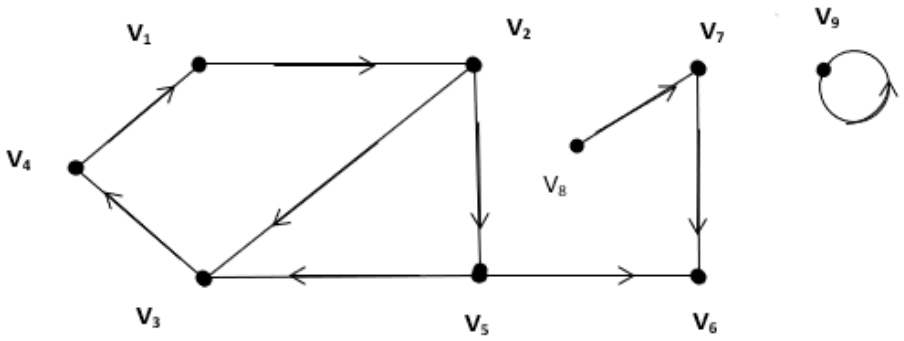
(i) $x_1 \oplus (x_2 * x'_3)$ (ii) $(x_1 \oplus x_2)' * x_3$

c) Find Meet-irreducible elements and antiatoms for the lattices $\langle S_{60},\ D\rangle$ **(4)**

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

a) Given $\frac{dy}{dx} = xy$ with $y(1) = 5$. Using Euler's method find the solution correct to three decimal position in the interval $[1,1.5]$ taking step size $h = 0.1$. **(5)**

b) Find all node base of following digraph shown in figure. **(5)**



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

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

a) Find the solution of the following differential equation $\frac{dy}{dx} = x + y$ using Runge-Kutta second order method for $x = 0.1,\ 0.2,\ 0.3$ and 0.4. Given that $y = 1$ when $x = 0$. **(5)**

b) Draw Hasse diagram for the poset $\langle S_{210},\ \mathbf{D} \rangle$; where $a\mathbf{D}b$ means a divides b. **(5)**

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