Enrollment No: _______________________ Exam Seat No:_______________________

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Computer Oriented Numerical Methods

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

Semester : 2 **Date : 25/04/2018** **Time :10:30 To 1:30** **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 ________ method combines the features of Bisection and Secant methods.
(a) Newton-Raphson (b) False position (c) none of these

b) The _______ method has a fast rate of convergence.
(a) Bisection method (b) False position method (c) Secant (d) none of these

c) AX = b is called a non-homogeneous system of linear equations, when ____.
(a) b = 0 (b) $b \neq 0$ (c) none of these

d) The Gauss-Siedel method is an _______ method.
a) direct (b) iterative (c) none of these

e) The Euler's method is the Runge-Kutta method of _____ order.
(a) 3^{rd} (b) 1^{st} (c) 4^{th} (d) 2^{nd}

f) Out of four Runge-Kutta methods, the Runge-Kutta method of ___ order is having the largest error.
(a) 3^{rd} (b) 1^{st} (c) 4^{th} (d) 2^{nd}

g) The numerical integration of one variable is called a ________.
(a) curvature (b) quadrature (c) none of these

h) The relation $\{(1,1),(1,3),(1,4),(3,1),(3,3),(3,4)\}$ on the set $\{1,2,3,4\}$ is ____________.
(a) symmetric (b) reflexive (c) anti-symmetric (d) transitive

i) Relation $R=\{(a,a),(b,b),(c,c)\}$ is ________ on $A=\{a,b,c\}$.
a) symmetric b) reflexive c) transitive d) all of these

j) Which of the following subsets are partitions of $\{1,2,3,4,5\}$?
(a) $\{1,2\},\{2,3,4\},\{5\}$ (b) $\{1\},\{2,3,4\},\{4,5\}$
(c) $\{1\},\{3,4\},\{5,2\}$ (d) $\{1,2\},\{3,4\},\{4,5\}$

k) Which of the following is a poset?

(a) $\langle R,<\rangle$ (b) $\langle R,>\rangle$ (c) $\langle R,=\rangle$ (d) None of thesse

l) If $\langle L,*,\oplus,',0,1\rangle$ is a complemented lattice and $a\in L$ then $a\oplus a' =$________.

(a) 0 (b) 1 (c) a (d) none of these

m) Which of the following are anti-atoms of Boolean algebra $\langle S_{30},D\rangle$?

(a) 6 (b) 10 (c) 15 (d) all of these

n) If $\langle S_{20},*,\oplus,',1,20\rangle$ is a Boolean algebra then complement of 2 is _________.

(a) 3 (b) 6 (c) 7 (d) does not exist

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

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

a) Find the root of the equation $x^2 - 9x + 1 = 0$ correct up to three decimal places using the Bisection method. **(5)**

b) Find the solution of $\frac{dy}{dx} = e^x - y$ up to the fifth approximation. Using Picard's method given that $y(0) = 0$. **(5)**

c) Find a root of the equation $x\sin x + \cos x = 0$ correct up to three significant figures using the Newton-Raphson method. **(4)**

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

a) Solve the following system of linear equations by finding A^{-1} by the Gauss-Jordan method. $x + 2y + z = 3;\ x + y + 3z = 14;\ x + 4y + 9z = 6.$ **(5)**

b) Solve the following system of linear equations by the Gauss-Siedel method. **(5)**

$4x + 2y - 2z = 4;\ 3x - 8y + 3z = -4;\ 2x + 5y + 9z = 12.$

c) Solve the following system of linear equations by the Gauss-Elimination method. **(4)**

$x + 3y - 2z = 5;\ 2x + y - 3z = 1;\ 3x + 2y - z = 6.$

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

a) Evaluate $\int_0^{\frac{\pi}{2}} e^{\sin x}\, dx$ by Simpson's 1/3 rule and taking n=6. **(5)**

b) Evaluate $\int_2^6 \log x\, dx$ by Simpson's 3/8 rule and taking n = 6. **(5)**

c) Given the data below find the isothermal work done on the gas as it is compressed from $v_1 = 22L$ to $v_2 = 2L$. Use $W = -\int_{v_1}^{v_2} p\, dv$ **(4)**

V L	2	7	12	17	22
P. Atm	12.20	3.49	2.049	1.44	1.11

Use Trapezoidal Rule.

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

a) Using Euler modified method, obtain a solution of $\frac{dy}{dx} = x + |\sqrt{x}|, y(0) = 1$ for the range $0 \le x \le 0.6$ in steps of 0.2 . **(5)**

	b)	Determine $y(0.1)$ and $y(0.2)$ correct to four decimal places from $\frac{dy}{dx} = 2x + y, y(0) = 1$. Use fourth order Runge-Kutta method.	**(5)**
	c)	Use Regula-Falsi method to find a real root of the equation $\log x - \cos x = 0$ correct to three decimal places.	**(4)**
Q-6		**Attempt all questions**	**(14)**
	a)	Find the cover of an each element and draw the Hasse diagram of $\langle S_{90}, D\rangle$	**(5)**
	b)	Prove that $\langle S_{30}, D\rangle$ is a lattice, where D denotes divides relation.	**(5)**
	c)	Prove that $\langle P(X), \subseteq\rangle$ is an equivalence relation. Where X be a non-empty set.	**(4)**
Q-7		**Attempt all questions**	**(14)**
	a)	Prove that $\langle N, D\rangle$ is a poset, where D denotes divides relation.	**(10)**
	b)	Prove that $\langle S_{42}, D\rangle$ is a complemented lattice, where D denotes divides relation.	**(4)**
	c)	Draw the hasse diagram of $\langle P(X), \subseteq\rangle$, Where $X = \{a, b, c\}$ and $\subseteq$ denotes the relation of "subset".	
Q-8		**Attempt all questions**	**(14)**
	a)	Let m be a positive integer greater than 1, show that the relation $R = \{(a,b) \mid a \equiv b(\bmod m)\}$ is an equivalence relation on the set of integers. What are the partitions of the integers arising from congruence modulo 4?	**(5)**
	b)	Prove that $\langle R, \min, \max\rangle$ is a lattice.	**(5)**
	c)	Draw the directed graph that represents the relation $R = \{(a,b),(b,b),(b,c),(c,b)(d,c),(a,d),(d,b)\}$.	**(4)**