Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Computer Oriented Numerical Methods

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

Semester : 2 **Date : 25/04/2018** **Time : 10:30 To 01:30** **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 – Jordan method in which the set of equations are transformed into diagonal matrix form.
(A) True (B) False

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

c) 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

d) Newton forward interpolation formula is used to interpolate the values of function $f(x)$ near the end of a set of tabular values.
(A) True (B) False

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

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

g) 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

h) 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

i) The auxiliary quantity s_1 obtained by Runge – Kutta fourth order for the differential equation $\frac{dy}{dx} = x^2 + y^2,\ y(0) = 1$, when $h = 0.1$ is
(A) 0.1 (B) 0 (C) 1 (D) none of these

j) Out of method of False Position and Secant method, the rate of convergence is faster for _____

k) As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called _____

l) Write Newton's backward interpolation formula.

m) Write Lagrange's inverse interpolation formula.

n) Write formula for Simpson's $3/8^{th}$ rule.

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)**

$$10x_1 + x_2 + 2x_3 = 44$$
$$2x_1 + 10x_2 + x_3 = 51$$
$$x_1 + 2x_2 + 10x_3 = 61$$

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

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

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

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

x	20	25	30	35
y	0.342	0.423	0.500	0.650

Find $x(0.390)$ 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 inverse of the matrix in C language. **(5)**

b) Using Newton's backward interpolation formula, find the value of $f(4.25)$ if **(5)**

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

c) Find the root of the equation $\cos x - 3x + 1 = 0$ correct to three decimal positions using False position 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 by Gauss-Jacobi method. **(5)**

$$5x_1 + 2x_2 + x_3 = 12$$
$$x_1 + 4x_2 + 2x_3 = 15$$
$$x_1 + 2x_2 + 5x_3 = 20$$

c) The function $f(x)$ is given as follows: **(4)**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	1	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0

Compute the integral of $f(x)$ between $x=0$ and $x=1.0$ using Trapezoidal rule.

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

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

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

c) A table of x vs $f(x)$ is given below. Find the value of $f(x)$ at $x = 4$ using Lagrange's interpolation formula. **(4)**

x	1.5	3	6
$f(x)$	– 0.25	2	20

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

a) Find the positive root of the equation $x^3-4x+1=0$ to three significant digits using Secant method. **(5)**

b) 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)**

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

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

a) Given $\frac{dy}{dx}=xy$ with $y(1)=5$. Find the solution correct to three decimal position in the interval $[1,\ 1.5]$ using step size $h=0.1$ using Runge-Kutta second Order method. **(7)**

b) Solve the differential equation $\frac{dy}{dx}=x^2+y^2$ by Predictor-Corrector method. Given that $y(0)=1,\ 0\le x\le 1$. **(7)**