Enrollment No: ______________________ Exam Seat No:______________________

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Computer Oriented Numerical Methods
Subject Code : 4CS02ICN2 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 convergence in the Gauss – Seidel method is faster than Gauss – Jacobi 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) 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) The method of false position has _____ convergence than the bisection method.
(A) faster (B) lower (C) equal (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) 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

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

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

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) 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

k) Newton's backward 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) If $y' = -y,\ y(0) = 1$, then by Euler's method, the value of $y(1)$ is

(A) 0.99 (B) 0.999 (C) 0.981 (D) none of these

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)**
$27x + 6y - z = 85,\ 6x + 5y + 2z = 72,\ x + y + 54z = 110$

b) 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 $y(300)$.

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

Q-3 **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) Given the table of values as **(5)**

x	20	25	30	35
$y(x)$	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)**

$5x-2y+3z=18,\ x+7y-3z=-22,\ 2x-y+6z=22$

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

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

b) From the following table, estimate the number of students who obtained marks less than 45. **(5)**

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of students	31	42	51	35	31

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

Q-5 **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) Solve the following system of equations using Gauss-Jordan method: **(5)**
$x+2y+z=3,\ 2x+3y+3z=10,\ 3x-y+2z=13$

c) Use Trapezoidal rule to evaluate $\int_0^1 x^3\,dx$ considering five sub-intervals. **(4)**

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

a) Evaluate $\int_0^1 x^3 e^{-x}\,dx$ using Simpson's 3/8th rule. **(5)**

b) Write a program to find the transpose of the matrix in C language. **(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-7 **Attempt all questions** **(14)**

a) Given that one of the roots of the non-linear equation $x^3-2x-5=0$ lies in the interval $(1.75,\ 2.5)$. Find the root correct to four significant digits using False position method. **(5)**

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

c) Write a program to find the trace 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 fourth Order method. **(7)**

b) 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 $x=0$. **(7)**