[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2064)

14666

B. Tech 4th Semester Examination

Numerical methods and Computer Programming (O.S.)

AS(ID)-4001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five question in all selecting one question from each of the section A, B, C, and D. Section E is compulsory, attempt all the subparts of this section.

SECTION - A

1. (a) Using Lagrange's Interpolation formula find f(a), given

x :	5	7	11	13
f(x) :	150	392	1452	2366

(10)

(b) By means of Newton's divided difference formula, find the value of f(8) and f(15) from the table

x :	4	5	7	10	11	13
f(x) :	48	100	294	900	1210	2028

(10)

2. (a) Interpolate the population of a town for the year 1974 using Gauss's backward formula, given that

Year :	1939	1949	1959	1969	1979	1989
Population (in thousand) :	12	15	20	27	39	52

(10)

(b) Write a computer program in C/C++ for the Newton's forward Interpolation method. (10)

SECTION - B

3. (a) Using the Bisection Method, Compute a root of $x^3-x-1=0$ upto three decimal places in four stages. (10)

(b) Apply Newton's Raphson method to find a real root of the equation $3x = \cos x + 1$ (10)

4. (a) Solve the system of equations

$27x + 6y - z = 85$

$6x + 15y + 2z = 72$

$x + y + 54z = 110$

Using Gauss-Seidal method. (10)

(b) Using Relaxation method, solve the system of equations

$10x - 2y - 3z = 205$

$-2x + 10y - 2z = 154$

$-2x - y + 10z = 120$ (10)

SECTION - C

5. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's 1/3 and Weddle's rules.

(10)

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's Integration in two steps taking h = 0.5 (10)

6. (a) Evaluate $\frac{dy}{dx}$ at x = 1.5

x :	0	.5	1	1.5	2
y :	0.3989	0.3521	0.2420	0.1295	0.0540

(10)

(b) Write a computer program in C to approximate definite Integral with Simpson's 1/3 Rule. (10)

SECTION - D

7. (a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5,\ t \geq 0$ given that u(x, 0) = 20, u(0, t) = 0, u(5, t) = 100. Compute u for the time-step with h = 1 by Cranck-Nicholson's Method. (10)

(b) Write the finite difference approximation to solve partial differential equation. (10)

8. (a) Solve the Laplace equation over the square region, satisfying the boundary conditions.

u (0, y) = 0, o $\leq$ y $\leq$ 3

u (3, y) = 9 + y, 0 $\leq$ y $\leq$ 3

u (x, 0) = 3x, 0 $\leq$ x $\leq$ 3

u (x, 3) = 4x, 0 $\leq$ x $\leq$ 3 (10)

(b) Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ under conditions

u (0, t) = u (1, t) = 0, and

u (x, 0) = sin π x, 0 $\leq$ x $\leq$ 1 using

Schmidt method, by taking h = 0.2 and k = 0.02 (10)

[P.T.O.]

SECTION - E

9. (a) If $f(x)=\frac{1}{x^2}$, find f(a, b) and f(a, b, c) by using divided difference.

(b) Find the polynomial which takes the values:

x :	0	1	2
y :	1	2	1

(c) State the iterative formula for Regula Falsi method to solve f(x)=0.

(d) Write the iterative formula of Newton's Raphson Method to find $\sqrt{N}$.

(e) Write a sufficient condition for Gauss-Seidal method to converge.

(f) State Romberg's method Integration formula to find the value of $I=\int_a^b f(x)dx$.

(g) Write a computer program in C for Newton's Raphson method.

(h) Write down the standard five point formula to solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$.

(i) Find $\frac{dy}{dx}$ at x = 10, for the following data:

x :	2	4	6	8	10
y :	6	54	134	246	390

(j) Evaluate $\left(\frac{\Delta^2}{E}\right)e^x\left(\frac{Ee^x}{\Delta^2 e^x}\right)$ (2×10=20)