[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2063)

814

B.Tech 4th Semester Examination

Computer Based Numerical Analysis

AS-4004

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 questions selecting one from each section. Section E is compulsory.

SECTION - A

1. (a) Prove that nth forward difference of polynomial of degree 'n' is constant.

   (b) Using Newton's divided difference formula find the interpolating polynomial for data.

x	1	2	4	6
y	14	15	5	9

   Also find value of y at x = 5 **(20)**

2. (a) Find f(32) using Gauss forward interpolation formula for the data

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

   (b) From the following table estimates the number of students who obtained marks between 40 and 45 **(20)**

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

SECTION - B

3. (a) State and Prove the convergence condition of iteration method to solve non-linear equations.

   (b) Find the iteration equations of Gauss seidal method to solve system of linear equation given below. Hence solve it

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$
$$-x_1 - x_2 - 2x_3 + 10x_4 = 9$$
$$10x_1 - 2x_2 - x_3 - x_4 = 3$$
$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

(20)

4. (a) Find a root of equation $\cos x = xe^x$ using Regula Falsi method correct to four decimal places.

   (b) Explain Relaxation method to solve system of linear equations. **(20)**

SECTION - C

5. (a) Find the interpolating polynomial for $\frac{dy}{dx}$ from the data given below using Newton's forward interpolation formula.

x	4	6	8	10
y	1	3	8	16

   (b) Find the value of x for which f(x) is maximum is given range of x in data given below. Also find maximum value of f(x). **(20)**

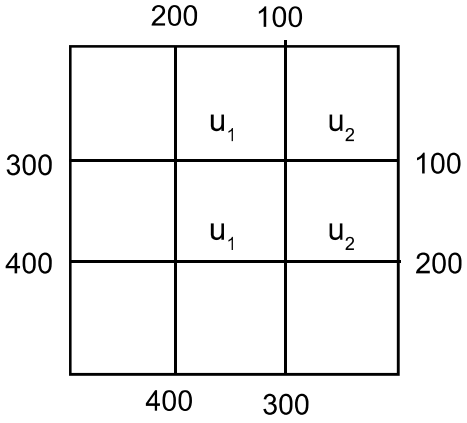
x	9	10	11	12	13	14	15
f(x)	1330	1340	1320	1250	1120	930	725

6. (a) Find the value of $\int_0^{\pi/3} \tan x dx$ using composite Simpson's rule with $h = \frac{\pi}{6}, \frac{\pi}{12}, \frac{\pi}{24}$ and then apply Romberg method.

(b) Find the Crank Nicolson's difference equation corresponding to parabolic equation. **(20)**

7. (a) Find the value of $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with 13 ordinates.

(b) Find the solution of Laplace equation $u_{xx} + u_{yy} = 0$ over following square mesh given below.



(20)

8. (a) Find the solution of $u_{xx} + u_{yy} = 0$ over square mesh of side 4 units satisfying boundary conditions

$u(0, y) = 0, 0 \leq y \leq 4, u(4, y) = 12 + y, 0 \leq y \leq 4, u(x, 0) = 3x.$ for $0 \leq x \leq 4, u(x, 4) = x^2 \quad 0 \leq x \leq 4$

[P.T.O.]

(b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to conditions

$u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$, $u(0, t) = u(l, t) = 0$ using DuFort Frankel method for two levels taking $h = \frac{1}{3}, k = \frac{1}{36}$ **(20)**

SECTION - E

9. Each part carries 2.5 marks.

(a) Find Newton Raphson iteration formula to solve non linear equations.

(b) Jacobi/Gauss Seidal method is applicable for every system of linear equation. Comment the statement.

(c) Prove that $E = 1 + \Delta = (1 - \nabla)^{-1}$

(d) Write Gauss forward interpolation formula explaining the terms involved.

(e) Find the finite difference expression for $\frac{d^2y}{dx^2}$ from Newton's forward difference interpolation formula

(f) Find the value of $\int_0^1 \frac{dx}{1+x}$ by Trapezoidal rule using 5 ordinates.

(g) From the following data find population in 1965

Years	1961	1971	1981	1991	2002
Population	46	66	81	93	101

(h) Explain partial Pivoting.