15088

B. Tech 4th Semester Examination

Numerical Methods & Computer Programming (OS)

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 questions in all. Select one question from each section A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Use Newton's Forward Interpolation Formula to evaluate sin 52°, given that

θ:	45°	50°	55°	60°
sinθ:	0.7071	0.7660	0.8192	0.8660	(10)

   (b) Using Gauss's Forward Interpolation Formula, find a polynomial of degree 4 which takes the following function f(x):

x:	1	2	3	4	5
f(x):	1	−1	1	−1	1	(10)

2. (a) Use Newton's divided difference interpolating polynomial and hence find f(15):

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

[P.T.O.]

   (b) Find the missing term in the following table using interpolation:

x:	1	2	4	5	6
y:	14	15	5	—	9	(10)

SECTION - B

3. (a) Find the root of equation cos x - xe^x = 0 using Bisection method correct to four decimal places up to eight iterations.   (10)

   (b) Using Newton Raphson method to find the smallest root of the equation.
        f(x) = x^3 − 5x + 1   (10)

4. (a) Using Jacobi's method, solve the equations:
        15x + y − z = 14, x + 20y + z = 23, 2x − 3y + 18z = 37.

   (b) Solve the equations by Relaxation method:
        10x–2y–3z=205, –2x+10y–2z=154, –2x–y+10z=120
                                                                (10)

SECTION - C

5. (a) Find y' and y" at x = 1.1, 1.5 , 1.9 from the following data:

x:	1.0	1.2	1.4	1.6	1.8	2.0
y:	0	0.128	0.544	1.2696	2.432	4.000	(10)

   (b) Evaluate the integral $\int_0^1 \frac{x}{1+x^2} dx$, using Boole's rule. Compare the error with exact value.   (10)

6. Apply Romberg's method to evaluate $\int_4^{5.2} \log x \, dx$ given that:

x:	4.0	4.2	4.4	4.6	4.8	5.0	5.2
logx:	1.3863	1.4351	1.4816	1.526	1.5686	1.6094	1.6486

                                                                (20)

SECTION - D

7. Solve the Poisson's equation $u_{xx}+u_{yy}=-81xy$; $0<x<1$, $0 < y < 1$; given that $u(0, y) = 0$, $u(x,0) = 0$; $u(1, y) = 100$, $u(x,1) = 100$ and $h = 1/3$.   (20)

8. Solve the boundary value problem $u_t = u_{xx}$, under the conditions $u(0, t) = u(1, t) = 0$ and $u(x ,0) = \sin\pi x$; $0 \le x \le 1$; using Schmidt method (take $h = 0.2$ and $\alpha = 0.5$).   (20)

SECTION - E

9. (a) What is the difference between Transcendental equation and polynomial equation?

    (b) The interval in which the real root of the equation $x^3 - 2x - 5 = 0$ lies is...............

    (c) When a linear system is said to be ill conditioned and well conditioned?

    (d) By Gauss-Elimination method solve the equations $x+y=2$ and $2x+3y=5$.

    (e) Prove that $E = \Delta + 1$ and $E = e^{hD}$.

    (f) Evaluate $\Delta^2 \cos 3x$.

    (g) Write down Newton's Backward interpolation formula and Lagrange's interpolation formula.

    (h) Define the terms: Interpolation and Extrapolation with examples.

    (i) The number of sub intervals required for Boole's rule is
         ....

    (j) The equation $u_{xx} + 3u_{xy} + u_{yy} = 0$ is classified as................
                                                              (10×2=20)