[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2125)

15143

B. Tech 5th Semester Examination

Numerical Methods (OS)

AS-5012

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 selecting one question from each section A, B, C, D. Section E is compulsory.

SECTION - A

1. (a) Find all the roots of the equation $x^3 - 2x^2 - 5x + 6 = 0$ by Graeffe's method (10)

   (b) Using the method of False position, to find the 4^{th} root of 32 correct to three decimal places. (10)

2. (a) State and prove the convergence criteria for iteration method to find the roots of an equation. (10)

   (b) Find by Newton's method by real root of an equation $3x=\cos x+1$ correct to 4 decimal places. (10)

SECTION - B

3. (a) Solve the equations by Gauss Seidel method $2x+y+6z=9$, $8x+3y+2z=13$, $x+5y+z=7$ (10)

   (b) Obtain by power method, the numerically dominant eigen values and eigen vectors of the matrix

$$A=\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$$ (10)

[P.T.O.]

4. (a) Apply the partition method to obtain the inverse of the matrix

$$A=\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$$ (10)

   (b) Using Jacobi method, find all the eigen values and eigen vector of matrix

$$A=\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$ (10)

SECTION - C

5. (a) Find Newton's divided difference formula and relation between divided and forward difference. (10)

   (b) Apply Bessel's formula to find the value of f(27.5) from the table

x:	25	26	27	28	29	30
f(x):	4.000	3.846	3.704	3.571	3.448	3.333

(10)

6. (a) From the following table, estimate the number of students who obtained marks between 40 and 45.

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

(10)

   (b) Apply Lagrange's method to find the value of x when f(x)=15 from the given

x:	5	6	9	11
f(x):	12	13	14	16

(10)

SECTION - D

7. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's 1/3 and Weddle's Rule. (10)

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

8. (a) Apply 4th order RK method to find approximate value of y(0.2). Given that $\frac{dy}{dx} = x + y,\ y(0) = 1$ taking step size 0.1 (10)

   (b) Find by Taylor series method, the values of y at x=0.1 and x=0.2 to five places of decimal from $\frac{dy}{dx} = x^2 y - 1,\ y(0) = 1$ (10)

SECTION - E
(Compulsory)

9. (a) State the advantages of Bisection method.

   (b) Discuss Gauss-Seidal method to solve system of equations.

   (c) Explain the rate of convergence.

   (d) Write a short note on Romberg integration.

   (e) Compare Gauss Jacobi and Gauss Seidal methods.

   (f) Prove that $\Delta = E\nabla = \nabla E$.

   (g) Write the Newton Backward divided difference formula.

   (h) Prove that divided differences are symmetric.

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

   (j) Write the standard five point formula to solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$. (10×2=20)