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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

- Find all the roots of the equation $x^3 - 2x^2 - 5x + 6 = 0$ by Graeffe's method (10)
 - Using the method of False position, to find the 4th root of 32 correct to three decimal places. (10)
- State and prove the convergence criteria for iteration method to find the roots of an equation. (10)
 - Find by Newton's method by real root of an equation $3x = \cos x + 1$ correct to 4 decimal places. (10)

SECTION - B

- Solve the equations by Gauss Seidel method $2x + y + 6z = 9$, $8x + 3y + 2z = 13$, $x + 5y + z = 7$ (10)
 - Obtain by power method, the numerically dominant eigen values and eigen vectors of the matrix

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

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- Apply the partition method to obtain the inverse of the matrix

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

- Using Jacobi method, find all the eigen values and eigen vector of matrix

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

SECTION - C

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

- 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)

- 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)