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Seventh Semester B.E. Degree Examination, Feb./Mar.2022 Numerical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Solve the equations using gauss elimination method,
- $$\begin{aligned} 3x + y + 2z &= 3 \\ 2x - 3y - z &= 3 \\ x + 2y + z &= 4 \end{aligned}$$
- (10 Marks)
- b. Explain briefly, (i) Round-off Error (ii) Truncation Error (10 Marks)

OR

- 2 a. Show that the system is ill-conditioned,
- $$\begin{aligned} 10x_1 + 7x_2 + 8x_3 + 7x_4 &= 32 \\ 7x_1 + 5x_2 + 6x_3 + 5x_4 &= 23 \\ 8x_1 + 6x_2 + 10x_3 + 9x_4 &= 33 \\ 7x_1 + 5x_2 + 9x_3 + 10x_4 &= 31 \end{aligned}$$
- (10 Marks)
- b. Using Jacobi's iteration method, solve the system of equations,
- $$\begin{aligned} 10x + 2y + z &= 9 \\ x + 10y - z &= -22 \\ -2x + 3y + 10z &= 22 \end{aligned}$$
- (10 Marks)

Module-2

- 3 a. Using Newton's forward interpolation formula, calculate value of exponential (1.75) from the following datas and hence evaluate it from the given table.

x	1.7	1.8	1.9	2.0
y = e ^x	5.474	6.050	6.686	7.389

(10 Marks)

- b. Using Lagrange's Interpolation formula. Find the value of y(10) from the following table:

x	5	6	9	11
y	12	13	14	16

(10 Marks)

OR

- 4 a. Find the largest eigen value and the corresponding eigen vector of the matrix,

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$$

(10 Marks)

- b. Apply the power method to find the dominant eigen value and eigen vector of the matrix,

$$A = \begin{bmatrix} 2 & -12 \\ 1 & -5 \end{bmatrix}$$

(10 Marks)

Module-3

- 5 a. Evaluate $\int_0^1 x^3 dx$ with five sub-intervals by Trapezoidal rule. (10 Marks)

b. Given that,

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
log(x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

- Evaluate $\int_4^{5.2} \log x dx$ by Simpson's $\frac{3}{8}$ rule. (10 Marks)

OR

- 6 a. The population of a certain town as obtained from Census data is shown in the following table.

Year	1951	1961	1971	1981	1991
Population (in thousand)	19.96	39.65	58.81	77.21	94.61

Estimate the rate of growth of the population in the year 1981.

(10 Marks)

- b. The following table of values of x and y is given,

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

Find $\frac{dy}{dx}$ when $x = 1$.

(10 Marks)

Module-4

- 7 a. By the method of least squares, find the straight line that best fits the following data:

x	1	2	3	4	5
y	14	27	40	55	68

(10 Marks)

- b. Fit a parabola of the form $y = a + bx + cx^2$ to the following data:

x	1	2	3	4	5	6	7
y	23	5.2	9.7	16.5	29.4	35.5	54.4

(10 Marks)

OR

- 8 a. Explain motivation and objectives of curve fitting. (10 Marks)
 b. Explain the use of cubic splines for solving problems and reduction of errors. (10 Marks)

Module-5

- 9 a. Find a real root of the equation $x^3 - 6x - 4 = 0$ by bisection method. (10 Marks)
 b. Find a real root of $xe^x = 2$ using Regula-Falsi method. (10 Marks)

OR

- 10 a. Explain motivation and objectives of Root finding. (10 Marks)
 b. Explain simulated Annealing and Local and Global minima. (10 Marks)
