MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

II Semester M.Sc (Mathematics), End Semester Makeup Exams, June 2017

Subject: Numerical Analysis I [MAT 608]

Time: 3 Hrs. **Max. Marks: 50**

✍ **Note: a) Answer any Five questions.**
b) All questions carry equal marks.

1A. Define Free and Basic variables in a system of equations. Find the general solution of the equations, $x_1 - 2x_2 + x_3 - 5x_4 + 2x_5 = 0$, $x_1 - 3x_2 + 2x_3 - 3x_4 = 0$, $2x_2 - 6x_3 + 3x_4 + x_5 = 0$.

1B. Apply Gauss backward interpolation formula to find the value of y(1.5), given y(0) = 2, y(1) = 3, y(2) = 6, y(3) = 9.

1C. Determine the Cubic Splines satisfying the data f(0) = – 1, f(1) = 1, f(2) = 2 with M(0) = M(2) = 0 **(3 + 3 + 4)**

2A. Perform two iterations of the Chebyshev method to find a root of the equation $x^3 - 5x + 1 = 0$, Choose $x_0 = 0.5$

2B. Find the inverse of the matrix $A = \begin{bmatrix} 0 & 3 & 4 \\ 1 & 0 & 2 \\ -2 & 3 & 1 \end{bmatrix}$ using Gauss-Jordan Method

2C. Define an ill-condition problem. Solve the system of equations:

10x -7y + 3z + 5u = 6, -6x + 8y –z – 4u = 5, 3x + y + 4z + 11u = 2,

5x - 9y - 2z + 4u = 7 by Gauss elimination method. **(3 + 3 + 4)**

3A. Solve by relaxation method, the following set of equations:
10x -2y – 3z = 205, -2x + 10y – 2z = 154, -2x – y + 10z = 120.

3B. Consider the equations 2x + y + 3z = 1, 4x + 3y – z = 6, x + 5y + 3z = 4. Use the LU decomposition method to solve the system

3C. Given the following values, $f(0)=1, f(1)=3, f'(0)=1, f'(1)=7$. Construct Hermite interpolation polynomial for the above data and estimate f(0.5). **(3 + 3 + 4)**

4A. Fit a polynomial of the second degree to the data points (x, y) given by (0, 1), (1, 2), (2, 4), (3,1), Use Least square principle method.

4B. Solve the following system of equations by Cholesky method

$2x_1 + x_2 – x_3 = 6$, $x_1 – 3x_2 + 5x_3 = 11$, $–x_1 + 5x_2 + 4x_3 = 13$.

4C. Define Given's rotation. Using Jacobi's method, find all the Eigen values and the eigen vectors of the matrix $B = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$. **(3 + 3 + 4)**

5A. Solve the following set of equations by relaxation method:

$10x – 2y – 3z = 205$, $–2x + 10y – 2z = 154$, $–2x – y + 10z = 120$.

5B. Solve the following system of equations using Gauss Seidal's method.

$2x + y + 4z = 7$, $– x + 4y + 2z = 5$, $3x + y + 2z = 6$. Carry out four iterations by taking (0, 0, 0) as the initial solution.

5C. Find the largest Eigen value in magnitude and corresponding Eigen vector of the matrix $A = \begin{bmatrix} 1 & 3 & 2 \\ -1 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$. Take (1, 0, 0) as the initial vector. Carry out four iterations

(3 + 3 + 4)

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