

Name of the Student: _____ I.D. No. _____

Name of the Teacher: _____ Section No. _____

Note: Check the total number of pages are Five (5).
(Six (6) Multiple choice questions and Two (2) Full questions)

The Answer Tables for Q.1 to Q.6 : Marks: 2 for each one ($2 \times 6 = 12$)

Ps. : Mark {a, b, c or d} for the correct answer in the box.

Q. No.	1	2	3	4	5	6
a,b,c,d						

Quest. No.	Marks
Q. 1 to Q. 6	
Q. 7	
Q. 8	
Total	

Question 1: For the Linear System $Ax = b$, where

$$A = \begin{bmatrix} 1 & 0.5 \\ -2 & 1 \end{bmatrix}.$$

In the LU factorization with $u_{ii} = 1$, $i = 1, 2$ of the matrix A , the matrix L is given by:

(a) $\begin{bmatrix} 1 & 0 \\ 0.5 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ -2 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

Question 2: The norm of the Jacobi iteration matrix for the linear system
 $2x - y + z = 1$, $x - y - 2z = -1$, $x + y + 3z = 2$
is:

(a) 1.0 (b) 0.33 (c) 3.0 (d) 0.5

Question 3: The relative error of the linear system $x_1 + 2x_2 = 3$, $1.01x_1 + 2x_2 = 3.01$
with approximate solution $x^* = [3, 0]$ is:

(a) 4.0 (b) 3.04 (c) 5.5 (d) 4.5

Question 4: The value of α such that the approximation of $f(2)$ is equal to 0 using a linear
interpolation at $(1, 2)$ and $(3, \alpha)$ is:

(a) 2.0 (b) 1.0 (c) -1.0 (d) -2.0

Question 5: If $f(x) = \frac{1}{x}$, then the second order divided difference $f[1, 2, 1]$ is equal to:

(a) 1.0 (b) 0.25 (c) 0.5 (d) -1.5

Question 6: If $f(x) = x^3$, $x_0 = 0$, $x_1 = 1$ and $p_1(1.5) = 4.5$ is the approximation of $f(x)$
using linear polynomial, then the value of η in the error formula is:

(a) 1.325 (b) -0.5 (c) 0.125 (d) 0.25

Question 7: Use LU-factorization method with Doolittle's method to find the solutions of the following consistent linear system using best value of α . [6 points]

$$\begin{aligned}x_1 + 0.5x_2 + \alpha x_3 &= 0.5 \\2x_1 - 3x_2 + x_3 &= -1 \\-x_1 - 1.5x_2 + 2.5x_3 &= -1\end{aligned}$$

Question 8: Let $f(x) = (x + 1) \ln(x + 1)$ be the function defined over the interval $[1, 2]$. Find the approximation of $(2.9 \ln 2.9)$ using quadratic Lagrange interpolating polynomial for equally spaced data points defined over the interval $[1, 2]$ and find absolute error. Compute the error bound for fifth degree Lagrange interpolating polynomial for equally spaced data points for the approximation of $(2.9 \ln 2.9)$. [7 points]