

EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF MATHEMATICS

MATH 373 – NUMERICAL ANALYSIS ENGINEERS

LAB QUIZ1-A

QUESTION 1	QUESTION 2	QUESTION 3	TOTAL
14	18	18	50

1) (14 p) Consider the function

$$f(x) = \cos(x) - 4x + 2$$

Use **Secant Method** and **Bisection Method** to find the roots of the given function. Start with $(a, b) = (0, 1.5)$ and $(p_0, p_1) = (0, 1)$.

a) Write the function in **MATLAB** language (3)

$$y = \cos(x) - 4 * x + 2$$

b) Write the derivative of the function in **MATLAB** language (3)

$$dy = -\sin(x) - 4$$

c) How many iterations did **Secant Method** obtained? 5 or 6 (1.5) What is the root with this method? 0.69242503151 (1.5)

d) How many iterations did **Bisection Method** obtained? 17 or 18 (1.5) What is the root with this method? 0.69243049622 (1.5)

e) Which method is the best? **Secant Method** (1) ; Why is the best? **Less iteration** (1)

- 2) (18 p) Use the user-friendly program developed for the **Fixed Point** and **Newton-Raphson** method to determine the roots of the simultaneous nonlinear equation. Employ initial guesses of $(x_0, y_0) = (0.9, 0.9)$.

$$F(x, y) = 2x^2 - x - 3y + 1$$

$$G(x, y) = 3x - 3y - 1$$

- a) Write the function in MATLAB language (5)

$$f1 = 2 * x1^2 - x1 - 3 * x2 + 1;$$

$$f2 = 3 * x1 - 3 * x2 - 1;$$

- b) Write the derivatives of the functions in MATLAB language (5)

$$f1x = 4 * x1 - 1;$$

$$f1y = -3;$$

$$f2x = 3;$$

$$f2y = -3;$$

- c) How many iterations did **Fixed Point System** obtain? 6 (2)
and does it converge? Yes (2)

- d) How many iterations did **Newton Method** obtain? 7 (2)
and does it converge? Yes (2)

3) (18 p) Use **Jacobi and Gauss-Seidel iterations** to find x_k . Start with $x_0 = (0,0,0)$.

$$2x + y + 8z = 1$$

$$-x + 7y - 3z = 4$$

$$6x + 3y - 2z = 8$$

6	3	-2
-1	7	-3
2	1	8

$$A = [6, 3, -2; -1, 7, -3; 2, 1, 8]$$

$$b = [8; 4; 1]$$

$$x_0 = [0; 0; 0]$$

a) How many iteration did **Jacobi Method** obtained? **11 (2.5)**
and does it converges? **Yes (2.5)**

b) How many iteration did **Gauss-Seidel** obtained? **8 (2.5)**
and does it converges? **Yes (2.5)**

c) Which method is the best? **Gauss-Seidel (2.5)**
Why is the best? **Less iteration (2.5)**

d) Solve the above system of linear equation using **LU decomposition**. What value did you obtained?

$$x = 0.9564 \text{ (1)}$$

$$y = 0.6256 \text{ (1)}$$

$$z = -0.1923 \text{ (1)}$$