Philadelphia University **Student Name:**

Faculty of Engineering **Student Number:**

Dept. of Electrical Engineering

Final Exam, Second Semester: 2023/2024

Course Title: Engineering Analysis (2)	**Date: 6/6/2024**
Course No: (610262)	**Time Allowed: 2 Hours**
Lecturer: Dr. Mohammed Mahdi	**No. of Pages: 4**

Q1 / 10	*Q2 / 10*	*Q3 / 10*	*Q4 / 10*	*Total / 40*

Question 1: Multiple Choice Questions . (10 Marks)

1. Using **Bi-section** iterative method, the **second iteration** root approximation of the equation **sin(x) = 1/x** in the interval (1, 1.5) is:

   A) 1.125 B) 11.25 C) 0.1125 D) none of choices

2. Using **false position** iterative method, the **first iteration** root approximation of $\sqrt[4]{32}$ in the interval (2, 3) **approximately** is:

   A) 22.461 B) 2.2461 C) 0.2246 D) none of choices

3. Using **Newton-Raphson** iterative method, the **first iteration** root approximation of the equation $\mathbf{e^x = 4x}$ with xo=2 **approximately** is:

   A) 2.183 B) 21.83 C) 0.2183 D) none of choices

4. The **Eigen values** of the matrix A=$\begin{bmatrix} 1 & 2 \\ 3 & 3 \end{bmatrix}$ are:

   A) 0.46458, 0.6458 B) 4.4658, - 0.6458 C) 4.6458, 6.458 D) none of given

5. Using **Newton's interpolating polynomials**, the interpolating polynomial to the data: (1,1), (2,5) is:

   A) 3+4x B) -3-4x C) -3+4x D) none of choices

Question 2: (10 Marks)

Objectives: This question is about linear regression and non-linear regression.

For the following data:

x	1	2	3	4	5
f(x)	2	4	5	4	5

A) **Apply linear regression**, then **find f (3.5)** from the resultant model. (5 Ms)

B) **Apply nonlinear regression** (exponential model), **then find f (3.5)** from the resultant model. (5 Ms)

Question 3: (10 Marks)

Objectives: This question is about matrices.

A) If the determinant of the matrix below is 13, then the **value of b22** is? (3 Ms)

$$[B] = \begin{bmatrix} -1 & 5 \\ 2 & b_{22} \end{bmatrix}$$

B) Given the system below, what are **the values of a and b**? (5 Ms)

$$\begin{bmatrix} 3 & 1 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

C) For $\boldsymbol{A} = \begin{bmatrix} \mathbf{0} & \mathbf{1} \\ \mathbf{-6} & \mathbf{-5} \end{bmatrix}$ what are the **Eigen values of $\mathbf{A^2}$** ? (2 Ms)

Question 4: (10 Marks)

Objectives: This question is about numerical integration.

Given the integration $\int_0^1 \frac{1}{1+x^2}\,dx$ it is required to:

A) Find the approximated result using **composite trapezoidal** rule with h=0.25. (5 Ms)

B) Find the approximated result using **1/3 composite Simpson** rule with h=0.25. (5 Ms)