


Philadelphia University Faculty of Engineering Department of Computer Engineering		Date:- 29/07/2018 Allowed time:-60 minutes
Engineering Analysis (630262)		First Exam
Student Name:-..... ID:-.....		

**Notes:** All trigonometric functions are in radian scale.  
Round your calculations to 4 significant digits

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**Question 1:** Use **Bisection method** to approximate the root of the following equation using  $x_s = 10$  and  $x_e = 12$ , with relative error  $\epsilon_a < 0.03$   
20 points

$$f(x) = 3 - 4\sqrt{x+2} + x$$

**Question 2:** Use **Newton-Raphson method** to approximate the root of the following equation using  $x_0 = 3.5$ , with relative error  $\varepsilon_a < 0.02$

**20 points**

$$f(x) = x^3 \sin(x)$$

**Question 3:** given the following system of linear equations; perform **two** **Guess-Siedel iterations**. **20 points**

$$4x - y + 2z = 12.5$$

$$2x - 6y + 3z = 23.1$$

$$x + y + 5z = 9.7$$

**Question 4:** Use **Second Order Newton Interpolation** to find  $f_2(x)$  using the following points then find  $f(1)$ : **20 points**

x	-2	0	3
f(x)	14	-8	19

**Question 5:** Chose the correct answer for the following questions.

**20 points**

1- If  $x_5 = 10.39$  and  $x_6 = 10.41$  then  $x_6$  is correct for \_\_\_\_ significant digits.

- a). 1                                      b). 2                                      c). 3                                      d). 4

2- The inverse of  $A = \begin{bmatrix} 1.6 & 0.9 \\ 3 & 2 \end{bmatrix}$  is:

a).  $[A]^{-1} = \begin{bmatrix} 4 & -1.8 \\ -6 & 3.2 \end{bmatrix}$                                       b).  $[A]^{-1} = \begin{bmatrix} 3.2 & -1.8 \\ -6 & 4 \end{bmatrix}$

c).  $[A]^{-1} = \begin{bmatrix} -1 & 4 \\ -2 & -7 \end{bmatrix}$                                       d).  $[A]^{-1} = \begin{bmatrix} 4 & 1.8 \\ 6 & 3.2 \end{bmatrix}$

3- The Eigen values of  $A = \begin{bmatrix} -1 & 4 \\ -2 & -7 \end{bmatrix}$  are:

a).  $\lambda_1 = 5, \lambda_2 = 3$

b).  $\lambda_1 = -5, \lambda_2 = 3$

c).  $\lambda_1 = 5, \lambda_2 = -3$

d).  $\lambda_1 = -5, \lambda_2 = -3$

4- The value of  $L_0$  using first order Lagrange Interpolation on the following points is:

x	4	6
F(x)	0	-6

a).  $L_0 = \frac{x-6}{2}$

b).  $L_0 = \frac{6-x}{2}$

c).  $L_0 = \frac{x-4}{2}$

d).  $L_0 = \frac{x+4}{2}$