



Dept. of Computer Engineering  
First Exam, First Semester: 2015/2016

Course Title: Engineering Analysis II  
Course No: (630262)

Date: 1/12/2015  
Time Allowed: 50 minutes

NOTES: - Round ALL your calculations to 4 significant digits  
- Angles for trigonometric functions are in radian scale

Please choose your section:

Instructor:  Eng. Anis Nazer  Eng. Sultan Al-Rushdan

Lecture time:  10:10 ح ث خ  13:10 ح ث خ  11:15 ن ر

**Question 1:** (10 marks)

Consider the following equation, the solution is in the range [1 , 1.5]

$$x^2 e^x = 4$$

- a) Perform iterations using **bisection** method until  $E_{rel} < 5\%$  (5 marks)  
b) Start with  $x_0=1$  and use **Newton-Raphson iteraions** to find the root with  $E_{rel} < 5\%$  (5 marks)

**Question 2:** (5 marks)

Consider the following system of linear equations:

$$\begin{bmatrix} 4 & -7 & -2 \\ 5 & -3 & 1 \\ 1 & 1 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -9 \\ -2 \\ -19 \end{bmatrix}$$

- a) start with  $x=1.5$  ,  $y=2.5$  ,  $z=-1.4$  and find values of  $x$  ,  $y$  and  $z$  after **three** Gauss-Seidel iterations (if necessary, rearrange the system to make the iterations converge to the solution)  
b) find the absolute error in the **last** iteration

**Question 3:** (5 marks)

Answer the following questions: (1 mark each)

- a) Assume that  $x_5=6.323$  is correct for two significant digits, and  $y_5=2.542$  is correct for 3 significant digits. How many significant digits are correct in the sum (  $x_5+y_5$  ) ?  
b) Write the formula used to approximate the root in the false position method  
c) Write  $x_L$  and  $x_U$  such that the false position metohd can be applied to solve  $x^2-\sin(x)=2$   
d) Mark the following statements as true or false:  
(I)  $[A][A]^T=[A]^T[A]$   
(II)  $[A][A]^T$  is symmetric  
e) Given  $[A]=\begin{bmatrix} x & -2 \\ 5 & -3 \end{bmatrix}$  find "x" such that the eigen values of [A] are -1 and 2