Philadelphia University
Faculty of Engineering

Student Name:
Student Number

Dept. of Computer Engineering
First Exam, First Semester: 2016/2017

Course Title: Engineering Analysis II	**Date: 13/11/2016**
Course No: (630262)	**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: ☐ **8:10 ح ث خ** ☐ **8:15 ن ر** ☐ **11:15 ن ر**

Question 1: (7 marks)

Solve the following equation using bisection method. Perform 4 iterations and find the relative error in **each** iteration
The root is between [-2,0]

$$x-2=2xe^{0.1x^2}$$

$f(x)=x-2-2xe^{0.1x^2}$
$x_L=-2$, $f(-2)=1.967$ positive
$x_U=0$, $f(0)=-2$ negative

x_L (+)	x_U (-)	x_m	$f(x_m)$	E_{rel}
-2	0	-1	-0.7897 (-)	
-2	-1	-1.5	0.2570 (+)	33.3%
-1.5	-1	-1.25	-0.3272 (-)	20%
-1.5	-1.25	-1.375	-0.05267 (-)	9.09%

Question 2: (7 marks)

Find the root of the following function using **three** Newton Raphson iterations starting with $x_0=0.3$, and calculate the absolute error in each iteration

$$f(x)=7\sin(x)e^{-x}-1$$

$f(x)=7\sin(x)e^{-x}-1$
$f'(x)=7\cos(x)e^{-x}-7\sin(x)e^{-x}$

x	$f(x)$	$f'(x)$	E_{abs}
0.3	0.5325	3.422	
0.1444	-0.1281	5.124	0.1556
0.1694	-3.763×10^{-3}	4.828	0.025
0.1702			0.0008

Good Luck

Question 3: **(6 marks)**

The impedance Z of an RLC circuit is calculated using the equation:

$$\frac{1}{Z}=\sqrt{\frac{1}{R^2}+\left(\omega C-\frac{1}{\omega L}\right)^2}$$

where:

R is the resistance,
C is the capacitance,
L is the inductance,
ω is the angular frequency.

If $R=225\,\Omega$ and $C=0.6\times10^{-6}F$ and $L=0.5\,H$, what is the angular frequency that will result in an impedance of $100\,\Omega$?

Use false position method with starting values of 200 and 300 and calculate ω with a relative error less than 2%

$$\frac{1}{100}=\sqrt{\frac{1}{225^2}+\left(0.6\times10^{-6}\omega-\frac{1}{0.5\,\omega}\right)^2} \qquad \rightarrow \qquad f(\omega)=\sqrt{\frac{1}{225^2}+\left(0.6\times10^{-6}\omega-\frac{1}{0.5\,\omega}\right)^2}-\frac{1}{100}$$

ω_L (+)	ω_U (-)	ω_m	$f(\omega_L)$	$f(\omega_U)$	$f(\omega_m)$	E_{rel}
200	300	228.1	8.336×10^{-4}	-2.137×10^{-3}	-2.917×10^{-4}	
200	228.1	220.8	8.336×10^{-4}	-2.917×10^{-4}	-2.917×10^{-5}	3.3 %
200	220.8	220.3	8.336×10^{-4}	-2.917×10^{-5}		0.227 %

Good Luck