Philadelphia University
Faculty of Engineering

Student Name:
Student Number

Dept. of Computer Engineering
Final Exam, Second Semester: 2013/2014

Course Title: Engineering Analysis II	**Date: 4/6/2014**
Course No: (630262)	**Time Allowed: 2 hours**
	No. of Pages: 3

NOTES:

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

Please choose your section:

Instructor: ☐ Dr. Mohammed Mahdi ☐ Eng. Anis Nazer ☐ Eng. Muteeah Al-Jawarneh

Lecture time: ☐ 10:10 ح ث خ ☐ 12:10 ح ث خ ☐ 14:10 ح ث خ ☐ 11:15 ن ر

Question 1: (5 points)

Use **false position** method to find the root of the equation

$$(x-4)^2(x+2)=0$$

Start with $x_L=-2.5$ and $x_U=-1$ and find x_{m0} , x_{m1} , and x_{m2}

Question 2: (5 points)

Perform **two Gauss-Seidel iterations** to approximate the solution of the following system of linear equations, start with $x_0=y_0=z_0=0$:

$$2x-3=y$$
$$4y+x=3+2z$$
$$x+2y=10-4z$$

Question 3: (5 points)

The table below shows the pressure of water vapor at different temperatures, approximate the pressure at 90 ^oC using **Lagrange interpolation with a third order polynomial**

Temperature (^oC)	44.5	61.7	82.3	100
Pressure (mm Hg)	178	209	397	760

Question 4: **(5 points)**

The following table gives information on ages and cholesterol levels for a random sample of 5 men, where *x* is the age and *y* is the cholesterol level. Use **non-linear regression** to find the exponential relation $y = C e^{Dx}$

x : Age	58	69	43	39	63
y : Cholesterol level	189	235	193	177	154

Question 5: **(5 points)**

a) Solve the differential equation using **Euler method** with a step size 0.2 to approximate $y(1)$.

$y' = \frac{x}{y}$, where $y(0.4) = 1.077$

b) Find the relative error in each step if the true solution is $y^2 = 1 + x^2$

Question 6: **(7 points)**

Approximate $\int_{1.17}^{2.37} f(x)\,dx$ for the function in the given table using :

a) Composite Trapezoidal method with 9 sample points

b) Composite 1/3 Simpson Method with 5 sample points

c) The true value of the integral is -0.22347 , calculate the relative error in parts (a) and (b), which approximation is better?

x	*f(x)*
1.02	0.52
1.17	0.39
1.32	0.25
1.47	0.10
1.62	-0.05
1.77	-0.20
1.92	-0.34
2.07	-0.48
2.22	-0.60
2.37	-0.72
2.52	-0.81
2.67	-0.89

Question 7: Multiple Choice **(8 points)**

Choose the correct answer:

1) Assume $\sqrt{2}=1.414213562$, how many significant digits are true if you approximate $\sqrt{2}$ by 1.414

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

2) Use Newton-Raphson iterations to solve: $x^3-1=x$. If you start with $x_0=1.5$, then $x_1=$

a) 1.3478 b) 1.325 c) 1.781 d) 1.148

3) Assume that the eigen values of $[A]=\begin{bmatrix}0 & 1\\ 8 & -2\end{bmatrix}$ and $[B]=[A]+[I]$ then the eigen values of $[B]$ are:

a) $\lambda_1=2$, $\lambda_2=-4$ b) $\lambda_1=4$, $\lambda_2=-8$

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

4) For the differential equation $y'=y$ with $y(1)=1$. Using Runge-Kutta method (RK2) with a step-size of 0.5, then y(1.5) =

a) 1.25 b) 2.25 c) 1.5 d) 1.625

GOOD LUCK