ECOR 2606 Midterm Summer 2012 A

Name: _____
Student Number: _____

Authorized memoranda: Closed book. Supplied formula sheets. Authorized calculators.
Do all questions. Marks as shown.
Show your work in the booklet provided.
Put your name and student number on this sheet and include it in the book.

1. A small flare is launched off the deck of a ship. The height of the flare above the water is given by: $h(t) = -4.9t^2 + 92t + 9$, where h is in metres and t is in seconds.

    a. One way of locating the maximum involves converting the problem into a root finding problem. Illustrate your understanding of this approach by giving all of the Matlab commands necessary to locate the maximum.
    b. There is another way of using Matlab to locate the maximum (one that does not involve root finding). Write a script file with all of the necessary commands to find the maximum and produce nicely formatted results.
    c. Write a Matlab script file to calculate how long the flare's height will be greater than 150m, and then output this time in a nicely formatted manner. Have the script check that the flare gets over 150m in height. If it does not, output 0.0s for the elapsed time.

(15 marks)

2. Viscous or frictional losses in pipe flow result in pressure drops that must be overcome. These are expressed in terms of a friction factor f. For turbulent flow in pipes, f is calculated from the Colebrook equation:

$$1/(\sqrt{f}) = -2\log_{10}\sqrt{\frac{e/D}{3.7} + \frac{2.51}{(\mathrm{Re})(\sqrt{f})}} \qquad \ldots.(1)$$

where *Re* = Reynold's Number
D = diameter (m)
e = roughness (m)

For e/D = 0.004 and Re = 2×10^5, we want to solve this equation for f.

a. Write Matlab code which will solve for the required f using fzero and produce nicely formatted results.
b. Illustrate your understanding of the secant search technique by completing the table below using equation (1).

f_{i-1}	f_i	f_{i+1}	$g(f_{i+1})$	E_{appox} (%)
0.005	0.05			

What is your best guess for the f which e/D = 0.004 and Re = 2 x 10^5?

(15 Marks)

3. You empty your change jar and separate the coins into three piles: dimes (10 cents), nickels (5 cents) and pennies (1 cent). You count them and discover that you have 180 coins in total, that there are twice as many dimes as pennies and that you have $9.60 in total.

a. Set up the equations to let you establish how many of each type of coin that you have.

b. Write the Matlab code to solve the set of equations you created in part a and write the results using fprintf.

c. Solve the set of equations manually using Gaussian elimination with partial pivoting.

(15 marks)