Answer the following problems... assume any missing data

Question 1

a) Write the following Matrix with Matlab environment

$$A = \begin{bmatrix} 2 & 1 & 0 & 4 \\ 6 & 3 & 4 & 1 \\ 0 & -1 & 2 & 3 \end{bmatrix}$$

   (i) Find the size of the matrix

   (ii) Display the second column of the matrix

   (iii) Display the element of the first row and second column

   (iv) Find the diagonal of the matrix

   (v) Find the inverse of the matrix and its transpose

   (vi) Display the minimum element in the matrix

b) Display roots of the following polynomial Matlab Language: $y = x^3 + 2x^2 - x + 3$

c) For the following differential equation: $\dfrac{d^2y}{dt^2} + \dfrac{dy}{dt} = y + t$ with initial conditions: $y = 0$ and $\dfrac{dy}{dt} = 0$. Write a program with Matlab to calculate the solution for times from -1 to 1.

d) Estimate the value of the integral form using Matlab: $\displaystyle\int_{x=-2}^{2} \left(5x^4 + 2x^3 - x^2 - x + 6\right)dx$

Question 2

a) Use the Matlab languge to solve the following system of equations

$x_1 + 2x_2 + 3x_3 = 0; \ 5x_1 + 2x_2 + 4x_3 = -2; \ 3x_1 - 2x_2 + 5x_3 = 4$

b) Write the Matlab command to resolve the following fraction into partial fractions

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

c) Finding inverse Laplace Transform using Matlab for the following form

$$Y(S) = \frac{2(S + 2)}{S(S + 5)(S + 1)}$$

d) Draw the two functions in the same graph

$$y_1 = x\cos(x) + \ln(x)$$

$$y_2 = x\sin(x) + e^x$$

$$x = [1:0.5:20]$$

a) Calculate the sum of the following series using Matlab: $\displaystyle\sum_{n=1}^{20} \frac{1}{n^2}\left(\frac{n+1}{n}\right)^n$

b) The displacement of the oscillating spring can be described by: $x = A\cos(\omega t)$. Find the displacement x for times from 0 to 10 seconds when the maximum displacement A is 4 cm, and the angular frequency is 0.6 radian/s. Present your results in a table of displacement and time values.

c) If a stone is thrown vertically upward with an initial speed u, its vertical displacement s after an elapsed time t is given by the formula s = ut – gt2/2, where g is the acceleration due to gravity. Air resistance is ignored. We would like to compute the value of s over a period of about 12.3 seconds at intervals of 0.1 seconds, and plot the distance–time graph over this period.

d) Write the following complex numbers in Matlab, then display the following for each one: real part-imaginary part- absolute- angle – conjugate

$$z_1 = 7 + i, \quad z_2 = 2e^{ix},$$

e) What value does the variable q and r contain after the Matlab code below executes?
```
% main file
A = [ 1 3 5 ];
[q r] = myfunc(A)

% end


function [r1,r2] = myfunc(p1)
% function file
n = length(p1);
r1 = sum(p1)./n;
r2 = sqrt(sum((p1 - r1).^2)./n);
return;
```

f) What value does the variable "final_value " contain after the Matlab code below executes?
```
i = 3;
j = 2;
k = 4;
final_value = 2;
for i = 1:5
    final_value = final_value + 2*i+3*j+k;
end
```

With my best wishes

This exam measures the following ILOs							
Question Number	Q1(1-a)	Q1(1-b)	Q1(1-c) , Q3(1-g)	Q1(1-e)	Q3(1-f)	Q1(1-h)	
	Q2(2-a)	Q4(1-d)	Q2(2-c)	Q2(2-b)	Q4(1-e)	Q2(2-d)	
Skills	Knowledge & understanding Skills			Intellectual Skills		Professional Skills	