ويسف / ١١٢٥

Mansoura University	Final Term Exam	Computer App. (MATLAB)
Faculty of Engineering	Jan. 2009	1st Year
Prod. & Mech. Design Dept.		Time All. 3 Hrs.

Answer All questions:

1) Given the following arrays

```
a =                                 b =
   3.3    5.4    1.3    0.9            1    9    2    3
   1.5    3.6    0.2    3.6           -1    4    0    3
  -5.0    7.2   -2.0    0.0            1    8   -4    0
```

a- Write the MATLAB commands to perform the following operations on array **a**

   i)   Add a fifth column of 0's

   ii)   Remove the second raw

   iii)   Square each element

b- Determine the result of each of the following MATLAB commands.

   i)   `mean (b,2)`

   ii)   `a(1 : 2, 2:end)`

   iii)   `a' + b';`

   iv)   `diag(round(a))`

   v)   `a <= b`

   vi)   `~(a & b)`

   vii)   `fix(a) | b`

   viii) `xor (b, eye(3,4))`

   ix)   `min(a)'`

   x)   `b.\a`

c- Write MATLAB programs to find the following sum,

$$1 - \frac{1}{2} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \cdots \frac{1}{1003}$$

2) a- Write a MATLAB function that reads an input temperature in Fahrenheit and converts it into absolute temperature in Kelvin, and writs out the result

   Hint: T (in Kelvin) $= \{ \frac{5}{9} T$ (in Fahrenheit) $- 32.0 \} + 273.15$

b - Write a MATLAB program to solve the following system of linear equations using Gauss Elimination method.

$$\begin{cases} x + 2y + 3z & = 1 \\ 4x - 5y + 6z & = 1 \\ 7x + 8y & = 1 \end{cases}$$

c - The cost per mile for a rented car is 2.5 *LE* for first 100 km, 1.5 *LE* for the next 200 km, and 1 *LE* for all kilometers in excess of 300 km. Write a MATLAB program that calculate the total cost and the average cost per km for a given number of kilometers.

4) a - Write a MATLAB program to calculate the roots of the following polynomial

$$2x^5 - x^2 - 3x + 22 = 0$$

b - Write MATLAB function to calculate volume, weight and surface area of a cylinder.

Hint : function input : cylinder height , cylinder diameter , cylinder material specific weight

function output : cylinder volume , cylinder weight, cylinder surface area

c - Plot the next three related functions, $y1 = 2cos(x)$, $y2 = sin(x)$, $y3 = 0.5cos(x)$
where x varies from 0 to 2π in step $= \pi/10$. The points should be connected with red, blue and black colored dashed lines with circular markers.

4) a - It is required to graph the effect of damping factor (ξ) on the magnification factor ($\dfrac{x}{x_0}$) for

different frequency ratios ($\dfrac{\omega}{\omega_n}$) which is calculated from $\dfrac{x}{x_0} = \dfrac{1}{\sqrt{\left[1 - \left(\frac{\omega}{\omega_n}\right)^2\right] + \left(2\xi\frac{\omega}{\omega_n}\right)^2}}$

Consider that ξ varies from 0.1 to 1 in step of 0.1

$\dfrac{\omega}{\omega_n}$ varies from 0 to 3 in step of 0.01

b- For a triangle with sides of length a, b, c, the area A is given as $A = \sqrt{S(S-a)(S-b)(S-c)}$
where $S = (a+b+c)/2$. Write a MATLAB function that accepts a, b, c as input and return
the value of triangle area as output

c - Using MATLAB and Image Processing Toolbox, write a program that:
  i-   Display a previously stored color image (image name is noisypic.jpg).
  ii- Enhance the image using a suitable noise filter and display the result.
  iii- Convert the filtered image to black and white image and display it.

With all good wishes and good luck. Dr. Ahmed Elkeran