Digital Image Processing, Assignment No.4 1399.10.2, **Submission deadline: 1399.10.8**

1- Download an image similar to Fig.4.17 that has some texture like the objects in this image.

a) Produce an image 50% of the size of input image (by size I mean total area of image) by row-column deletion.

b) Resize the output in (a) input to image original size using linear interpolation.

c) Apply 3x3 mean filter on original image prior to size reduction. Repeat steps a) and b).

d) Show, the original, reduced size and interpolated images in b) and c) in 4 windows. You should be able to see the aliasing effects in images produced in (b) and (c).

2- Download a standard image of image processing. Construct an image of a rectangle, the same size as downloaded image that looks line fig.4.24(a).

a) Show the spectrum of rectangle image without and then with multiplying it to $(-1)^{(x+Y)}$ before FFT calculation. Show the original image and two spectrums as Fig.4.24.b and4.24.d.
b) Translate and rotate the rectangle image, the function should receive these parameters as its input. Then show the spectrums as fig.4.25.
c) Show the phase angle images in 3 states as shown in Fig. 4.26.
d) Produce the output as of Fig.4.27 with the download standard image and the rectangle image.

3- Use the standard image downloaded in Ex.2. Design a symmetric filter function H(u,v).

Follow the 7 steps described in section 4.7.3 to filter the input image using the H(u,v).

Note: your program should have 7 steps as shown in section 4.7.3.

4- Design ideal, Gaussian and Butterworth low-pass filters, such that you can define a single D_0 for all three filters.

a) Call a function 3 times each time with a different D_0 parameter corresponding to 80, 90 and 95 percent of power spectrum. (Note: D_0 should be calculated accordingly). Another parameter is needed for the order of butterworth filter.
b) For each D_0, display the original and 3 filtered images. On top of each filtered image display filter type, D_0 value and the order of butterworth filter. For each D_0 value,

calculate and display 3 images that are the difference between the original image and the filtered image to compare the performance of 3 filtering method.

Additional Notes:

a) 1-(15) means the 1st question has 15 marks from 100.

b) About comments in the program:

Each question should be written as one function in Matlab, if the question has more than one independent part, each of those parts should be written as a function.

In a function, the input and output should be specified.

Bellow each function, a short description of function should be given, also you should describe the input and output parameters or variables as follows:

Description: Here you should give a brief description on what the function is supposed to do.

Input: name each input and its description. For example if the input is an image to this function you can write: Input: img1: color input image, or monochrome input image.

Output: same as described for Input.

The main part of the code, calls each function in an order. You can have "waite(0)" in the main between two function calls, to wait for pressing a key, to start executing the next function.

Deadline Monday Dey 08.

In case of delay (until 48 hours (2 days) after the dead line), your grade will be multiplied by 0.7.

From the 3rd day to end of 5th day after the initial deadline dead line, your grade will be multiplied by 0.3.

After the 5th day, I am sorry to say that you will lose the grade for this assignment.