ECE 148 **Signal Processing Applications** **Spring 2020**

Name: _____

Assignment 3: Digital highpass and lowpass filters

Due: Tuesday, May 5

1. _____/10
2. _____/10
3. _____/10
4. _____/10
5. _____/10
6. _____/10

Total:_____/60

1. Formulate a *3 x 3* matrix operator as the *gradient filter* in the discrete form and plot the *DTFT* frequency response of this highpass filter.

2. Apply the *gradient* filter to the image for edge detection. Your results should include (a) edge profile of the images in the horizontal direction, (b) edge profile in the vertical direction, (c) the combined form, and (d) superposition onto the original image.

3. Formulate a *3 x 3* matrix operator as the *Laplacian filter* in the discrete form and plot the *DTFT* frequency response of this highpass filter.

4. Apply the *Laplacian* filter to the attached image for peak detection. Show the result of (a) peak detection and (b) the superposition onto the original image.

5. Formulate a *3 x 3* matrix operator as the *moving average filter* in the discrete form and plot the *DTFT* frequency response of this lowpass filter.

6. Apply the *moving average filter* to the given image for smoothing. Show the result of (a) the lowpass filtering and (b) the superposition onto the original image.