CS 4420/5420	**Digital Image Processing**	Test 1
Name:	Fall 2016	Max Pts: 60

Important: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices, including a calculator and e-books. *Do not log into the computer during the test, or use any electronic or communications device. Change your cell phones to silent mode*. Any calculations and rough work can be done on the back side of the test pages. If there is a syntax error in any program segment, just write it down and you will get full credit for the problem. Please write legibly; if I cannot read what you wrote, I'll give you a zero. You will lose five points for not writing your name.

1. [10 pt] Explain the difference between scotopic and photopic vision. Which part of eye is responsible for each of those.

2. [10 pt] A common measure of transmission for digital data is the *baud rate*, defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information, and a stop bit. Using these facts, answer the following (assume 1K = 1024):

   (a) How many minutes would it take to transmit a 1024×1024 image with 256 intensity levels using a 56K baud modem?

   (b) What would the time be at 300K baud?

3. [10 pt] Consider the image segment shown:

3	1	2	1(q)
2	2	0	2
1	2	1	1
(p)1	0	1	2

Let $V = \{0, 1\}$ and compute the lengths of the shortest $4-$, $8-$, and $m-$path between p and q. If a particular path does not exist between these two points, explain why.

4. [10 pt] What would be the effect of setting the lower-order bit planes to zero on the histogram of an image in general. What would be the effect if we set the higher order bits to zero instead?

5. [10 pt] The probability distribution of pixel intensities in a 3-bit image is given as

   0.09, 0.22, 0.09, 0.14, 0.20, 0.11, 0.00, 0.15

   Create a lookup table to equalize this histogram.

6. [10 pt] Discuss the limiting effect of repeatedly applying a 3×3 lowpass spatial filter to a gray scale digital image. You may ignore the border effects.