CS 5420	**Visual Data Processing**	Test 1
Name:	Winter 2004	Max Pts: 44

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. *Do not log into the computer during the test.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [6 pt] Explain the difference between image enhancement and image restoration.

2. [16 pt] Give a set of gray-level slicing transformations capable of producing all the individual bit planes of an 8-bit monochrome image. For example, a transformation function with the property

$$T(r) = \begin{cases} 0 & 0 \leq r \leq 127 \\ 255 & 128 \leq r \leq 255 \end{cases}$$

produces an image of bit-plane 7 (most significant bit) in an 8-bit image.

3. [4 pt] When you enter a dark theater on a bright day, it takes an appreciable interval of time before you can see well enough to find an empty seat. Which of the visual processes is at play in this situation?

4. [10 pt] Suppose that a flat area with center at (x_0, y_0) is illuminated by a light source with intensity distribution

$$i(x, y) = Ke^{-[(x-x_0)^2+(y-y_0)^2]}$$

Assume for simplicity that the reflectance of the area is constant and equal to 1.0, and let $K = 255$. If the resulting image is digitized with k bits of intensity resolution, and the eye can detect an abrupt change of eight shades of intensity between adjacent pixels, what value of k will cause visible false contouring?

5. [8 pt] What happens if you perform histogram equalization on an image that has already been subjected to histogram equalization. Explain your answer.