CS 6420	**Topics in Image Processing and Multimedia**	**Test 1**
Name:	Spring 2011	Max Pts: 40

Important: This is an open book test. You can use any books, notes, or paper but no electronic device. *Do not log into the computer during the test, or use any electronic or communications device. Switch off your cell phones*. 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. [10 pt] What filter will you use to restore an image corrupted with a massive dose of salt-and-pepper noise? Can you use your filter in a real-time application where the timing is of big constraint? If yes, reason why it will not matter. If you cannot use your filter, which filter will give you a good enough approximation under the time constraint?

2. [10 pt] Construct a fully populated approximation pyramid and corrsponding prediction residual pyramid for the image

$$f(x,y) = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}$$

Use 2×2 neighborhood averaging for the approximation filter and assume the interpolation filter implements pixel replication.

3. [10 pt] Erosion of a set A by structuring element B is a subset of A as long as the origin of B is contained by B. Give an example in which the erosion $A \ominus B$ lies outside, or partially outside, A.

4. [10 pt] Consider a horizontal intensity profile through the middle of a binary image that contains a step edge running vertically through the center of the image. Draw what the profile will look like after the image has been blurred by an averaging mask of size $n \times n$, with coefficients equal to $1/n^2$. For simplicity, assume that the image was scaled so that its intensity levels are 0 on the left of the edge and 1 on its right. Also, assume that the size of the mask is much smaller than the image, so that image border effects are not a concern near the center of the horizontal intensity profile.