CIS 751 Final Exam

Due: **June 1st, 2004**

Use *your own words* to answer each question. 20% each. You get no credit for pasting material from the web.

1. Knowing that:

-1	0	$+1$		$+1$	$+2$	$+1$
-2	0	$+2$		0	0	0
-1	0	$+1$		-1	-2	-1

   convolusion kernels 'detect' vertical and horizontal edges in an image respectively. Come up with an approach to detect diagonal edges. You may either do a combination of the above, or create a new matrix. Describe your approach for the answer; explain why and how it works, and prove that your approach works (provide an example of it working, etc.).

2. Explain how Huffman compression works. Explain how Arithmetic Coding works. Why does Arithmetic Coding *usually* achieves better compression ratios than Huffman?

3. What is PCM? (describe) What improvement does DPCM bring? Why is it an improvement? What improvement does ADPCM bring?

4. What happens to an image if we zero out *higher* frequencies of its DCT? What happens to an image if we zero out *lower* frequencies of its DCT? What happens to an image if we zero out *mid*-frequencies of its DCT? Which one does JPEG use, how and why?

5. Discuss trends in lossy compression in relation to human senses—what colors we see better/worse, what sounds we hear better/worse, how quickly our eyes react to change, what frequencies we hear, etc., and how all these limitations are used by lossy compression methods, such as JPEG, MPEG, MP3s, etc.