1. (25) You have an image containing three types of objects, a horizontal line three pixels wide, a vertical line three pixels high, and an object in the form of a ‘+’ that is three pixels high and three pixels wide. Describe how you would process the image to create three images, each of which contains only one type of object.

2. (25) Describe the basic elements of a system for performing continuous on-line wire gauge measurements. The wire is highly reflective (specularly reflecting) and has a nominal diameter of 1 mil. The wire will always be found within a circular envelope of 3 mils perpendicular to the direction of travel. Include descriptions of a) the illumination source, b) optical techniques required to obtain accurate measurements, c) the relationship of the wire relative to the optics and illumination d) the resolution of the sensor required to provide an accuracy of .002 mil, and e) image processing and data analysis hardware required to provide real-time analysis of the data.

3. (25) Describe a minimal frame-buffer system that will perform a gray-scale erosion on an image digitized to 8 bits per pixel using a flat 3X3 square structuring element. Specify logic circuitry and data path widths in your description.

4. (25) You have just been awarded the hot-dog concession for Tiger stadium and have discovered that your costs are too high. You have decided to use a robot to pick up hot-dogs on a conveyor and place them into buns which are also on the conveyor. A second robot will pick up the buns. Both the hot-dogs and buns can come in any orientation and are randomly placed on the conveyor but do not touch. Describe a vision algorithm that will provide the necessary information to the robots so that the buns and hot-dogs can be picked up properly.