PHYSICS 2P51: Assignment 3 - Due Feb. 1, 2017

Readings: Course Notes, Meyer-Arendt Chapter 1

1. **Photoconductive Detector**

   (a) Explain why a GaSb photoconductive detector will not be sensitive to light of wavelength 2 μm.

   (b) Suggest photoconductive detectors that will detect light of wavelength 2.5 μm. What criterion does one use ?

   (c) If a photoconductive detector of dark resistance 10^6 Ω is placed in a voltage divider circuit with a 100 Ω resistor, determine the percentage change in the voltage across the 100 Ω resistor if light shining on the photodetector produces a 10% increase in the density of free carriers that contribute to the current.

2. A pinhole camera produces a 4-cm-high image of a telephone pole. Moving the camera 7 m farther away from the pole reduces the image size to 3 cm. To make the image 4-cm-high again, the camera has to be 3cm longer. How tall is the telephone pole?

3. A sheet of newsprint is viewed through a plate of glass that is placed on the newsprint and known to have a refractive index of 1.7. When looking through the plate, the newsprint appears to 4mm closer to the observer than without it. How thick is the plate?

4. What is the minimum angle of total internal reflection for light passing from glass of n=1.65 to water (n=1.333)?

5. How far from the true vertical does the setting sun appear to an observer under water?

6. A prism with a 60° apex shows minimum deviation for a particular wavelength at 58°. What is the refractive index for that wavelength?

7. If white light is incident at an angle of 35° on a slab of glass that for blue has refractive index of 1.64 and for red light of 1.56, what is the angular dispersion between the blue and the red inside the glass?