ECE 841 – Problem Set #3

Due: 04-23-03

1. The aperture shown below is centered at (x=0,y=0,z=0) in an opaque screen in the z=0 plane. Compute analytically the intensity of the *Fraunhoffer* diffraction pattern in the plane $z=z_0$. Make a 2-D grayscale plot of this intensity (dark=high, light=low) in the plane z=3.2 km. Note: assume the aperture is normally-illuminated with red laser light.

2. Any aperture may be approximated by a superposition of rectangles. Write a program to compute the *Fresnel* diffraction pattern of a superposition of non-overlapping rectangular apertures. Use this program to make a 2-D grayscale plot of the intensity of the Fresnel diffraction pattern of the aperture shown above in the following planes: a) z=1 mm, b) z=1 cm, c) z=10 cm, d) z=1 m, e) z=10 m, d) z=100 m, e) z=3.2 km. Compare the result from part (e) with the Fraunhoffer diffraction pattern obtained above.