*Questi*on 1 (parts a and b); 2 (parts a and b).

1. Stop and Lens Vignetting

A thin lens, $f = 80mm$, is used to image an object with a magnification of $m = -\frac{1}{2}$. The lens diameter is $D_{lens} = 25mm$ and the stop, $D_{stop} = 20mm$, is located $40mm$ in front of the lens. You may use any methods for this question.

a. When unvignetted at the lens, determine the unvignetted object diameter (FOV) in mm.

b. Repeat the above for the fully vignetted condition.

2. Air-Spaced Triplet

An air-spaced triplet objective is comprised of three thin lenses in air. The first lens, $f_1 = 100mm$, is located $t_{12} = 25mm$ from the second lens. The second lens, $f_2 = -50mm$, is located $t_{2S} = 25mm$ from the stop. The stop, $D_{stop} = 20mm$, is located $t_{S3} = 50mm$ from the final lens, $f_3 = 100mm$. Draw a diagram of the set up from the information given.

a. For an object located at infinity, determine the following properties of the system using paraxial raytrace methods.
    i. Entrance pupil location and size
    ii. Exit pupil location and size
    iii. System Focal length
    iv. Back focal distance
b. The maximum image height of the system is $h' = 50mm$. Determine the following.
    i. FOV for the image space
    ii. Required lens diameters for the system to be unvignetted
    iii. FOV for the object space