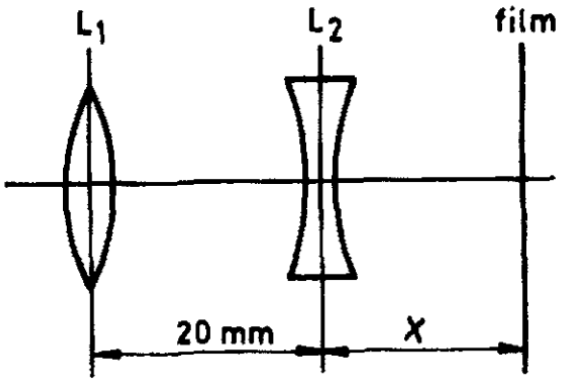
Total Marks = 100

Question 1: A 35 mm camera lens of focal length 50 mm is made into a telephoto lens by placing a negative lens between it and the film, as shown. L_1 = camera lens, f_1 = 50 mm, L_2 = negative lens, f_2 = -100 mm.



(a) What is the distance "X" if the system is focused at an object 50 cm in front of L_1 ? (**10 Marks**)

(b) What is the magnification produced by the lens combination ? (**10 Marks**)

Question 2: Consider the following simple telescope configuration made up of thin lenses as follows:
L_1: f_1 = 10 cm, Diameter = 4 cm
L_2: f_2 = 2 cm, Diameter = 1.2 cm
L_3: f_3 = 2 cm, Diameter = 1.2 cm

(a) Trace a bundle of rays through the system. (**10 Marks**)

(b) Calculate the position of the exit pupil and the diameter of the exit pupil (**10 Marks**)

(c) What is the function of the lens L_2 ? (**10 Marks**)

(d) Is the instrument a good match to the eye? (Explain) (**10 Marks**)

Question 3: A keratometer is a device used to measure the curvature of the cornea, particularly for fitting contact lenses. Light is reflected from the cornea, which acts like a convex mirror, and the keratometer measures the magnification of the image. The smaller the magnification, the smaller the radius of curvature of the cornea. If the light source is 12.0 cm from the cornea and the image's magnification is 0.0320, what is the cornea's radius of curvature? (**15 Marks**)

Question 4: Electric room heaters use a concave mirror to reflect infrared (IR) radiation from hot coils. Note that IR follows the same law of reflection as visible light. Given that the mirror has a radius of curvature of 50.0 cm and produces an image of the coils 3.00 m away from the mirror, where are the coils? (**15 Marks**)

Question 5: A certain camera has f numbers ranging from 1.2 to 22. If the len's focal length is 55 mm, what is the range of lens diameters for the camera? (**10 Marks**)