1. By stating the sign convention and assumptions used, derive the relation between object distance u, image distance v and focal length f for a concave mirror, when it forms real image of an object of finite size.(3 marks)

OR

2. Two thin convex lenses L_1.and L_2 of focal lengths f_1 and f_2 respectively placed coaxially in contact. An object is placed at a point beyond the focus of lensL_1. Draw a ray diagram to show the image formation by the combination and hence derive the expression for the focal length of the combined system. (3 marks) (Both to be done)

3. A convex lens, of focal length 20 cm, is placed co-axially with a convex mirror of radius of curvature 20 cm. The two are kept 15 cm apart from each other. A point object is placed 60 cm in front the convex lens. Find the positions of the image formed by this combination.(3 marks)

OR

(i)If f = 0.5 m for a glass lens, what is the power of the lens
(ii) the radius of curvature of the faces of double convex lens are 10 cm, 15 cm. its focal length is 12 cm. what is the refractive index of glass?
 (iii) a convex lens has 20 cm focal length in air. What is the focal length in water?(refractive index of air water = 1.33, refractive index of air glass = 1.5) (3 marks) (Both to be done)

4. Find the position of the image formed by the lens combination (3 marks)
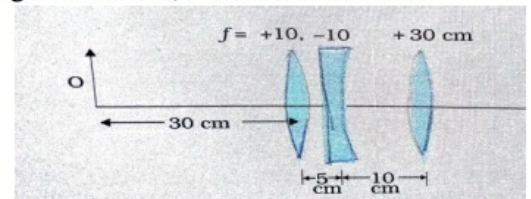
OR

A symmetric biconvex lens of radius of curvature R and made of glass of refractive index 1.5, is placed on a layer of liquid placed on top of a plane mirror as shown in the figure. An optical needle with its tip on the principal axis of the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x. On removing the liquid layer and repeating the experiment, the distance is found to be y. Obtain the expression for the refractive index of the liquid in terms of x and y. (3 marks) (Both to be done)

5. The near point of a hypermetric person is 75 cm from eye. What is the power and nature of corrective lens that enable him to read book clearly placed 25 cm away.(1 mark)

OR

Draw ray diagram for astronomical telescope(1 mark) (Both to be done)