Important Numerical from Geometrical Optics (Chapter-5)

1) An illuminated object is placed at right angle to the axis of a converging lens of focal length 15 cm and 22.5 cm from it. On the other side of the converging lens co-axial with it, a diverging lens of focal length 30 cm is placed. Find the position of the final image when the lenses are 15 cm apart and a plane mirror is placed perpendicular to the axis 30 cm beyond the diverging lens. **[Ans: final image coincides with object]**

2) Two thin convex lenses of focal lengths 20 cm and 5 cm are placed 10 cm apart. Calculate the positions of principle points of this combination and equivalent focal length.
[Ans: 6.67 cm; 13.34 cm; -3.33 cm]

3) If the dispersive power of crown and flint glasses are 0.2 and 0.4 respectively, find the focal length of the component lenses which form achromatic combination of focal length of 20 cm.
[Ans: 10 cm; -20 cm]

4) The focal length of a convex lens for a certain monochromatic light is 30 cm and the refractive index of its material for this light is 1.5. What will be its focal length for another monochromatic light whose refractive index is higher than that of the previous one by 2 %?

[Ans: 28.16 cm]

5) The yellow light has its wavelength $5893x10^{-10}$ m speed of $3x10^{8}$ m/s in air. Find the speed and wavelength in glass of refractive index 1.5. **[Ans : $2x10^{8} ms^{-1}$; $3928.66 x 10^{-10} m$]**

6) Both surfaces of a double convex lens have radii of 28 cm. If the focal length is 26.2 cm, what is refractive index of the material of lens? **[Ans: 1.5343] [TU 2-74]**

7) Two thin converging of focal lengths 30 cm and 40 cm respectively are placed coaxially in air separated by a distance of 20 cm. An object is placed 40 cm in front of the first lens. Find the position and nature of the image. [TU 2072]
[Ans: Real, inverted image is formed at a distance 36.5 cm behind the second lens]

8) A thin equi-convex lens of focal length 100 cm and refractive index 1.5 rests on an optically flat glass plate. Newton's rings are viewed normally by reflection using light of wavelength $5890x10^{-10}$ m. What is the diameter of fifth bright ring?

9) Two thin lens of focal length f_1 and f_2 separated by a distance d have equivalent focal length 50 cm. The combination satisfies the conditions for no chromatic aberration and minimum spherical aberration. Find the value of f_1, f_2 and d. Assume that both the lens are of same material. [TU 2074]

10) In Ramaden's eyepiece a coaxial lens system is used. There two lenses in air, each of same focal length, and separated by a distance of 2f/3. Find the positions of cardinal points. [TU 2074]

11) Two thin lens of focal length f_1 and f_2 separated by a distance having equivalent focal length 50 cm. The combination satisfies the conditions for no chromatic aberration and minimum spherical aberration. Find the separation between the two lenses, if both the lenses are of same materials. [TU 2073]