

Physics of Waves

PH11003

Tutorial 8 Problems

Topic : Interference

12 January 2023

[8.1] Light with wavelength $\lambda = 0.55 \mu\text{m}$ from a distant point source falls normally on the surface of a glass wedge. A fringe pattern whose neighbouring maxima on the surface of the wedge are separated by a distance $\Delta x = 0.21 \text{ mm}$ is observed in reflected light. Find: (a) the angle between the wedge faces; (b) the degree of light monochromatism ($\Delta\lambda/\lambda$) if the fringes disappear at a distance $l \approx 1.5 \text{ cm}$ from the wedge's edge.



] The convex surface of a plano-convex glass lens with curvature radius $R = 40 \text{ cm}$ comes into contact with a glass plate. A certain ring observed in reflected light has a radius $r = 2.5 \text{ mm}$. Watching the given ring, the lens was gradually removed from the plate by a distance $\Delta h = 5.0 \mu\text{m}$. What has the radius of that ring become equal to?

[8.3] Two thin symmetric glass lenses, one biconvex and the other biconcave, are brought into contact to make a system with optical power $\Phi = 0.50 \text{ D}$. Newton's rings are observed in reflected light with wavelength $\lambda = 0.61 \mu\text{m}$. Determine: (a) the radius of the tenth dark ring; (b) how the radius of that ring will change when the space between the lenses is filled up with water.

[8.4] In Michelson's interferometer the yellow sodium line composed of two wavelengths $\lambda_1 = 589.0 \text{ nm}$ and $\lambda_2 = 589.6 \text{ nm}$ was used. In the process of translational displacement of one of the mirrors the interference pattern vanished periodically (why?). Find the displacement of the mirror between two successive appearances of the sharpest pattern.

[8.5] In a two-beam interferometer the orange mercury line composed of two wavelengths $\lambda_1 = 576.97 \text{ nm}$ and $\lambda_2 = 579.03 \text{ nm}$ is employed. What is the least order of interference at which the sharpness of the fringe pattern is the worst?