Module 1 Unit 2

POLARIZATION – NUMERICAL PROBLEMS

1. It is desired to use a glass plate to obtain polarized light. If the refractive index of glass is 1.5, what is the polarizing angle?
2. Sunlight is reflected from the surface of water in a steady lake. The reflected light is 100% polarized at a certain instant. Find the corresponding declination angle. The refractive index of water is 1.33.
3. The critical angle of incidence for total reflection in case of water is 48°.What is its polarizing angle? What is the angle of refraction corresponding to the polarization angle?
4. An unpolarised falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristics directions of the sheets if the intensity of the transmitted light is one-third intensity of the incident beam?
5. If the plane of vibration of the incident beam makes an angle of 30° with the optic axis, compare the intensities of extraordinary and the ordinary light.
6. Light of intensity I_o is incident on a polarizer. What is the intensity of the resultant beam if: (i) incident light is unpolarised? (ii) Incident light is plane polarized with its electric field vector making an angle of 30° with the axis of polarizer.
7. Plane polarized light of wavelength 5400 Å is incident perpendicularly on a quartz plate cut with faces parallel to optic axis. Find the thickness of the quartz plate, which introduces phase difference of 60° between e-ray and o-ray. Given: μ_e= 1.553, μ_o=1.544.
8. At some arbitrary point, the electric field components of a polarized wave are given by E_x = 10 cos ωt and E_y = 20 cos (ωt+π). Determine the type of polarization and the direction of polarization.
9. Determine the state of polarization represented by E_x= E_o cos (ωt - kz) and E_y= E_o sin (ωt - kz).
10. Plane polarized light of wavelength 6000 Å is incident perpendicularly on a calcite plate of thickness 0.04 mm. Calculate the phase retardation that it will introduce between the e-ray and o-ray. Given: μ_e= 1.642, μ_o=1.478.
