Assignment on Polarization by SDG

1) Critical angle for glass placed in air is 40^0. Calculate the angle of refraction corresponding to the angle of polarization.

2) Two polaroids are aligned with their polarization axis parallel. One of the polaroids is rotated to 30^0 and then through 60^0, both with respect to the initial position. Find the ratios of transmitted intensities at these two positions.

3) Two polarizing sheets have their polarizing directions parallel so that the intensity of the transmitted light is a maximum. Through what angle must either sheet be turned so that intensity becomes one fourth of the initial value?

4) Find the state of polarization when x- and y- components of the electric field are
(i) $E_x = E_0 \sin(\omega t + kz)$ and $E_y = E_0 \cos(\omega t + kz)$
(ii) $E_x = E_0 \cos(\omega t + kz)$ and $E_y = (E_0/\sqrt{2}) \cos(\omega t + kz + \pi)$

5) Write an expression for a linearly polarized light wave of angular frequency ω propagating in the +z direction with its plane of vibration making an angle 60^0 to the xz plane.

6) Calculate the minimum thickness of quarter-wave plate with $\lambda = 5.8 * 10^{-7}$ m, $\mu_e = 1.553$ and $\mu_o = 1.544$.

7) A plane polarized light of wavelength 5893Å is incident on a thin quartz plate cut with faces parallel to the optic axis. Calculate (a) the minimum thickness of the plate, which introduces a phase difference 60^0 between the ordinary (O-ray) and extraordinary rays (E-ray) and (b) the minimum thickness of the plate for which the O-ray and E-ray waves will combine to produce plane polarized light. [Given that, $\mu_e = 1.553$ and $\mu_o = 1.544$].

8) A right circularly polarized beam of light (λ=5250Å) is incident normally on a double refracting crystal with optic axis parallel to the surface. The thickness of the crystal is (t) 0.003mm. It is also given that ($\mu_e - \mu_o$) = 0.175. Find the state of polarization of the emergent light beam.