Assignment 4

1. Linearly polarized light (with an irradiance of $300\ W/m^2$) aligned with its electric-field vector at $+55^\circ$ from the vertical impinges perpendicularly on an ideal sheet polarizer whose transmission axis is at $+10^\circ$ from the vertical. What fraction of the incoming light emerges?

2. The electric field components of a plane electromagnetic wave are

$$E_x = 2E_0 \cos(\omega t - kz + \phi)$$

$$E_y = E_0 \sin(\omega t - kz)$$

Draw the diagram showing the state of polarization when (a). $\phi = 0$ (b). $\phi = \frac{\pi}{2}$ (c). $\phi = \frac{\pi}{4}$

3. An ideal polarizer is rotated at a rate ω between a similar pair of stationary crossed polarizers. Show that $I = \frac{I_1}{8}(1 - \cos 4\omega t)$, where I_1 is the flux density emerging from the first polarizer and I is the final flux density.

4. A polaroid is rotated between two crossed polaroid. If an unpolarized beam is incident on the first polaroid, discuss the variation of the intensity of the emergent beam as the polaroid is rotated. What will happen if the polaroid is fixed and pass axis making an angle $45°$ with respect to first polaroid.

5. In the Young's double hole experiment the distance between the two holes is 0.5 mm, $\lambda = 5 \times 10^{-5}$cm and $D = 50$cm. What will be the fringe width.

6. Will we get an interference pattern in Young's Experiment if we replace the source slit by a single long-filament lightbulb? What would occur if we replaced the slits S1 and S2 by these same bulbs?