

PHY 353S - Electromagnetic Waves

Mid Term Test

4 pm, Wednesday 30th March 2000.

This Test is "Open Book"

- 1) What is the significance of the critical angle and what conditions are required for total reflection?
- 2) Circularly polarized light is incident on a $1/4$ wave plate. Using Jones matrices, calculate the polarization of the resulting beam.
- 3) An engineer is designing a spacecraft with a disc shaped highly-reflective solar sail. What radius of sail is required to generate a thrust of 1 N. [assume that the spacecraft is sailing away from the sun and the incident flux density is 1400 Wm^{-2}].
- 4) A window is glazed with two panes of glass separated by an intervening gap containing an unknown gas. Show that the propagation direction of the beam emerging from this window is the same for a window with only a single pane of glass.
- 5) A monochromatic laser beam (wavelength 550 nm, travelling in vacuum) is split equally into two. The beam are recombined but one beam has traveled 0.5 cm further than the other. If the form of the coherence function is

$$\gamma_{12}(\tau) = \exp(-i\omega\tau)\exp(-|\tau|/\tau_0),$$

and the coherence time of the laser is 10 pS, what is the intensity at the point of recombination?