

2.58J, HW# 3,

1. **Problem 2.6** (problem 1 from HW#2)
2. **Problem 3.31** (problem 3 from HW#2)
3. **Monte Carlo code** (problem 5 from HW#2)
4. **Surface Emissivity.** The refractive index of silicon at  $0.63 \mu\text{m}$  is  $(3.882, 0.019)$ , calculate the surface reflectivity, transmissivity, and emissivity of a semi-infinite silicon wafer (a) at normal incidence, (b) at  $30^\circ$  angle of incidence, and (c)  $60^\circ$  angle of incidence for both TE and TM waves. Also, estimate the penetration depth for normal incidence.
5. **Fresnel Formula for TE Wave.** Derive the Fresnel formula for a transverse electric wave incident onto a plane surface,
6. **Tunneling of Photons.** A vacuum gap of  $0.2 \mu\text{m}$  is formed between two glass substrates. Plot the transmissivity of light from one glass substrate into another as a function of angle of incidence for an incident TM wave at  $0.5 \mu\text{m}$ . The refractive index of the glass is taken as 1.46. Compare the results with the situation if a thin film of glass of  $0.2 \mu\text{m}$  is sandwiched between vacuum.