Problem Set 2023-3
Physics 265
First Semester, AY 2023– 2024
Release Date: 22 September 2023
Due: 6 January 2024
Ten points per number

1. Homogeneous dielectric film 1 (see Born & Wolf Section 1.6.4 and Fig 1.17 for schematic). Generate the reflectivity plots (similar to Figure 1.18, normal incidence, 512 data points) of the film within the optical thickness range: $0 \leq nh \leq \lambda_o$ for incident wavelength λ_o = 400 nm, 550 nm, 750 nm, and 1100 nm if applicable for your assigned materials. Additional information: index of layer 1 = 1.0, index of layer 2 = n_1, index of layer 3 = n_2.

   At what λ_o-value would the film best function as a beam splitter. Explain.

2. Homogeneous dielectric film 2. Generate the reflectivity plots (normal incidence) of the film within the optical thickness range: $0 \leq nh \leq \lambda_o$ for incident wavelength λ_o = 400 nm, 550 nm, 750 nm, and 1100 nm. Additional information: index of layer 1 = 1.0, index of layer 2 = n_2, index of layer 3 = n_1.

   At what λ_o-value would the film best function as a beam splitter. Which performs better as a beam splitter, film 1 or film 2? Explain.

3. Quarter-wave film 1 (optical thickness = $\lambda_o/4$). Generate the reflectivity plot (see Figure 1.19, normal incidence, 512 data points) of the film versus $n(\lambda_o)$ within the range: 400 nm $\leq \lambda_o \leq$ 800 nm. Additional information: index of layer 1 = 1.3, index of layer 2 = n_1, index of layer 3 = n_2.

4. Quarter-wave film 2. Generate the reflectivity plot (normal incidence) of the film versus $n(\lambda_o)$ within: 400 nm $\leq \lambda_o \leq$ 800 nm. Additional information: index of layer 1 = 1.3, index of layer 2 = n_2, index of layer 3 = n_1.

   Which performs better as an anti-reflective coating, film 1 or film 2? Explain.

END