PHYS 306 Spring 2010
Wave Motion and Electromagnetic Radiation

Homework Assignment

HW#9
Assignment Date: Apr. 06, 2010
Due Date: Apr. 13, 2010

1. Calculate the minimum spacing between the plates of a Fabry-Perot interferometer which would resolve two lines with $\Delta\lambda = 0.1$ Å at $\lambda = 6000$ Å. Assume the reflectivity to be 0.8. (Q16.2 in CH16)

2. Consider a monochromatic beam of wavelength 6000 Å incident normally on a scanning Fabry-Perot interferometer with $n_2 = 1$ and $F = 400$. The distance between the two mirrors is written as $h = h_0 + x$. With $h_0 = 10$ cm, calculate
   (a) The first three values of x for which we will have unit transmittivity and the corresponding value of m.
   (b) Also calculate the FWHM Δh for which the transmittivity will be half. (Q16.5 in CH16)

3. In continuation of Problem 2, consider now two wavelengths λ_0 (= 6000 Å) and $\lambda_0 + \Delta\lambda$ incident normally on the Fabry-Perot interferometer with $n_2 = 1$, $F = 400$ and $h_0 = 10$ cm. What will be the value of $\Delta\lambda$ so that $T = ½$ occurs at the same value of h for both the wavelengths. (Q16.6 in CH16)

4. A plane wave ($\lambda = 5000$ Å) falls normally on a long narrow slit of width 0.5 mm. Calculate the angles of diffraction corresponding to the first three minima. (Q18.1 in CH18)

5. A convex lens of focal length 20 cm is placed after a slit of width 0.6 mm. If a plane wave of wavelength 6000 Å falls normally on the slit, calculate the separation between the second minima on either side of the central maximum. (Q18.2 in CH18)