

Homework 2

Due date: 7th Muharam
Please solve all problems

Problem 1:

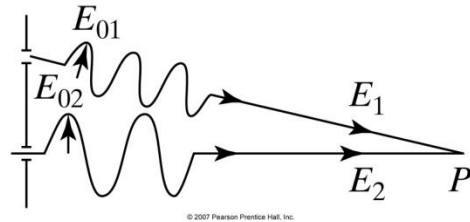
Two mutually coherent beams having parallel electric fields are described by:

$$E_1 = 3 \cos \left(ks_1 - \omega t + \frac{\pi}{5} \right)$$

$$E_2 = 4 \cos \left(ks_2 - \omega t + \frac{\pi}{6} \right)$$

With amplitudes in kV/m. The beams interfere at a point P where the phase difference due to path is $\pi/3$ (the first beam having the longer path). At the point of superposition, calculate:

- The irradiances I_1 and I_2 of the individual beams
- The irradiance I_{12} due to their interference
- The net irradiance
- The fringe visibility



Problem 2:

a. Show in a phasor diagram the following two harmonic waves:

$$E_1 = 2 \cos \omega t \quad \text{and} \quad E_2 = 7 \cos (\pi/4 - \omega t)$$

b. Determine the mathematical expression for the resultant wave.

Problem 3:

Standing waves are produced by the superposition of the wave

$$y = (7 \text{ cm}) \sin \left[2\pi \left(\frac{t}{T} - \frac{2x}{\pi \text{ cm}} \right) \right]$$

and its reflection in a medium whose absorption is negligible. For the resultant wave, find the amplitude, wavelength, length of one loop, velocity, and period.