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EECS 118: Optical Communication Systems
Problem Set No. 1 : General Introductory Principles

Problem 1) Wave Concepts
Write the equation for a wave with amplitude 3 Volts/cm , wavelength $5 \cdot 10^{-4}$ cm and frequency $3 \cdot 10^{13}$ Hz.
b) What are the period and angular frequency of the wave?
c) In what part of the electromagnetic spectrum is the wave?
d) What is the phase velocity of the wave?
e) What is the " index of refraction " ?

Problem 2) Fiber Attenuation
A fiber 50 km long has an attenuation of .5 dB/kms. Two such fibers are spliced together to form one fiber 100km long. The splice has a loss of .3dB and the connectors at each end have losses of 1 dB.
a) What is the total loss between the transmitter and receiver?
b) What is the power into the receiver when the power output from the transmitter is 1 mW?

Problem 3) Pulse Spreading in a Fiber
For a particular single mode fiber, the dispersion coefficient is 10 ps/nm/km. So:
How much does a 1ps pulse broaden when propagating 10 km if the initial pulse is "bandwidth linited " ?

Problem 4) Amplitude Modulation
The intensity of a lightwave carrier is modulated by a signal $mx(t) = 0.8cos(\omega_1 t)$.
Calculate the amplitude spectrum to within 5