1. Given a wave in air with $\vec{h} = \hat{z}5\cos(10^{11}t + kx)$
Find a) ω, b) k, c) propagation direction, d) polarization direction and e) corresponding $\vec{e}$.

2. a) Give 3 papers (titles, authors, vol. and page numbers) on "WDM" that were published in *Optics and Photonics News*. b) Give 5 papers (titles, authors, vol. and page numbers) on "optical cross connect" that were published in *IEEE Journal of Lightwave Technology*. c) Give 3 papers (titles and publication dates) on "soliton" that were published in *Laser and Focus World* as articles within the last 15 years.

3. a) A WDM system has linewidth of $3nm$ for one channel, carrier wavelength $\lambda_o = 1.5\mu m$ and 75 channels.
Find the bandwidth $\Delta\nu$ of each channel and the total bandwidth $\Delta\nu_{total}$ for the whole system assuming that there is no guard band between adjacent channels.
b) Suppose another system with $\Delta\nu_{total}$ and linewidth for a channel being the same as a) but $\lambda_o = 0.5\mu m$. Find the bandwidth $\Delta\nu$ of each channel and number of channels.

4. A laser is driven by a current source of 2.5A. Assume the efficiency for the laser is 8 electron for 1 photon. The photon energy of the laser is 0.8eV.
a) What are the frequency and wavelength of the laser?
b) Output optical power of the laser.

Extra-Credit
An EM wave travels in free space with the magnetic field $\vec{h} = (10\hat{y} + 5\hat{z})\cos(\omega t + 2y - 4z)$. Determine a) ω and λ, b) Magnetic field in phasor form, i.e. $\vec{H}$, c) time varying electric field, i.e. $\vec{e}$ and d) average Poynting vector, i.e. $\vec{S}_{ave}$.