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Roll No. 02414

SECOND SEMESTER

B.Tech. [Group A & B]

MID SEMESTER EXAMINATION (March- 2014)

AP-113: Applied Physics-II (Group A & B)

Time : 1:30 Hours *Max. Marks : 20*

Note: Answer *ANY FOUR* questions
Assume suitable missing data, if any.

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1. (a) Using Maxwell's equations deduce an expression for velocity of an electromagnetic wave passing through free space. Hence show that an electromagnetic wave is nothing but light. (3 M)

   (b) If the earth receives 3 cal/min/cm^2 solar energy then calculate the amplitudes of electric and magnetic field intensities received by earth. (2 M)

2. (a) Describe propagation of electromagnetic waves in a dielectric medium and derive an expression for refractive index of dielectric medium. (3 M)

   (b) A 1000 watt power lamp radiates light outwards uniformly. Calculate the electric and magnetic fields intensities at a distance of 2 m from the lamp. (2 M)

3. (a) Out of visible light and gamma rays which can most easily show Compton effect and why? Derive an expression for Compton shift and wavelength of scattered photon. (2.5 M)

   (b) An FM radio channel broadcasts its signal at 98.3 MHz. What is the wavelength of the signal in free space. This signal passes through an insulating ferrite with ε_r=10 and μ_r=1000. What is speed and wavelength of the signal in ferrite. (2.5 M)

4. (a) Define de Broglie phase velocity and particle velocity. Show that phase velocity exceeds the velocity of light. Also show that the particle velocity is equal to the group velocity of wave packet. (2.5 M)

   (b) Using Uncertainity principle, Show that protons, neutrons and alpha particles can exist within the nucleus. (2.5 M)

5. (a) What do you understand by harmonic oscillator? Obtain an expression for the energy eigen values of the harmonic oscillator applying Schrodinger equation. (2.5 M)

   (b) Determine an expectation value $\langle x \rangle$ of the position and $\langle p_x \rangle$ of the x-component of momentum for a particle trapped in a box L wide. (2.5 M)