(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1107 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. I) ODD SEMESTERTHEORY EXAMINATION 2013-14

ENGINEERING PHYSICS – I

Time : 3 Hours *Total Marks : 80*

Note :– Attempt questions from each Section as per instructions.

SECTION–A

1. Attempt all the **eight** parts of this question. Answer each part in short. Each part carries **2** marks : **(8×2=16)**

   (a) Show that the rest mass of photon is zero.

   (b) Distinguish between an ordinary photograph and a hologram.

   (c) Explain the concept of Maxwell's displacement current.

   (d) Why does an excessively thin film appear black in reflected system ?

   (e) What do you understand by specific rotation ? Write its unit.

   (f) What do you understand by population inversion in a laser system ? Give two necessary conditions for lasing action.

   (g) What are the necessary conditions for destructive interference in an anti-reflection coating ?

   (h) What are the main components of an optical fiber ?

SECTION–B

2. Attempt any **three** parts of this question. Each part carries **8** marks : **(8×3=24)**

   (a) A circular lamina moves with its plane parallel to the X-Y plane of a reference frame S at rest. Assuming its motion to be along x-axis (or y), calculate the velocity, at which its surface area would appear to be reduced to half to an observer in frame S at rest.

   (b) If $\vec{A} = xz^3\hat{i} - x^2yz\hat{j} + 2yz^4\hat{k}$, find the Curl $\vec{A}$ at point $(2, -1, 0)$. Is $\vec{A}$ irrotational ?

   (c) If the population ratio of the two states in gas laser is 1.80×10^{-35}. Calculate the temperature of active system if the wavelength of emitted radiation is 5893 Å.

   (d) Calculate the minimum thickness for an anti-reflection coating of refractive index 1.38 to minimize the reflection of light of wavelength 6000 Å.

   (e) The optical power after propagating through a fibre that is 450 m long is reduced to 35% of its original value. Calculate the fibre loss in dB/km.

SECTION–C

Note :— Attempt all the **five** questions of this section. Each question carries **8** marks. **(8×5=40)**

3. Show that a clock moving with velocity v relative to an observer appears to him to go slow by a factor of $1/\sqrt{1-\frac{v^2}{c^2}}$ then at rest relative to him. Give an example to show that time dilation is real effect.

OR

Deduce the relativistic velocity addition theorem. Show that it is consistent with the Einstein's second postulate of special theory of relativity.

4. What are coherent sources of light ? Explain temporal and spatial coherence with suitable examples.

OR

What is Rayleigh criterion of resolution ? Deduce an expression for resolving power of plane transmission grating.

5. What are the important features of stimulated emission ? Obtain a relation between transition probabilities of spontaneous and stimulated emissions.

OR

What is Double Refraction ? Explain the construction and working of Nicol's Prism.

6. Write Maxwell's equations in differential and integral form. Show that Faraday's law of electromagnetic induction can be expressed as, $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$.

OR

Using relevant Maxwell's equation, derive Coulomb's law in electrostatics. Further, show that the equation of continuity is contained in Maxwell's equations.

7. Describe the propagation mechanism and communication in step-index multimode fibre with suitable diagrams.

OR

What is the significance of reference beam in Holography ? Discuss different features of hologram with three applications of holographic plate.

Physical Constants :

Speed of light	$c = 3.0 \times 10^8\ m/s$
Planck's constant	$h = 6.62 \times 10^{-34}\ J\text{-}s$
Boltzman's constant	$k = 1.38 \times 10^{-23}\ J/K$
Permeability	$\mu_0 = 4\pi \times 10^{-7}\ H/m$
Permittivity	$\varepsilon_0 = 8.854 \times 10^{-12}\ F/M$