Autumn End Semester Supplementary Examination-2014

1st Semester B.Tech & B.Tech Dual Degree

PHYSICS-I

(PH-1001)

Full Marks: 60 **Time: 3 Hours**

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. (a) Two light waves of same amplitude coming from two coherent sources superpose to give the resultant wave whose amplitude is same as that of any individual wave. Find out the phase difference between the two individual waves. [2 × 10

(b) What do you mean by the interference of light due to division of wavefront and division of amplitude? Give one example of each.

(c) What is the highest order spectra that can be observed by using a plane diffraction grating having 12000lines/cm with light of wavelength 5893Å?

(d) Graphically show the intensity distribution curve in Fraunhoffer diffraction from single slit.

(e) Differentiate between ordinary and extra-ordinary rays in double refracting crystal.

(f) A ray of light is incident on the surface of a glass plate of refractive index 1.55 at the polarizing angle.Find the angle of refraction.

(g) Calculate the numerical aperture and acceptance angle of an optical fibre having the refractive indices of core and cladding as1.50 and1.45 respectively, when placed in air medium.

(h) What do you mean by metastable state?

(i) What is Faraday's law of electromagnetic induction? Express it mathematically.

(j) Define Poynting vector for a plane electromagnetic wave.

2. (a) With suitable diagram find the path difference between the corresponding reflected rays coming from a thin wedge shaped film and hence find out the condition of maxima and minima. [6

(b) Explain why the Newton's rings are circular in shape? [2

3. (a) Discuss the phenomenon of Fraunhoffer diffraction from single slit. Find out the condition of maxima and minima and hence show that the intensity of first secondary maxima is about 4.5% of that of principal maximum. [6

(b) A grating is made of 200 wires per cm placed at equal distance apart. The diameter of each wire is 0.025mm. Find the orders which will be absent from the spectra. [2

4. (a) Describe the main parts of an optical fibre. Write down the principle based on which it works and hence derive the expression for numerical aperture with suitable diagram. [6

(b) The electric field between two parallel metal plates of area $1cm^2$ having air in between changes at the rate of 1.2×10^8 [2

V/m.s. Calculate the displacement current. Permittivity of air is $8.85 \times 10^{-12} C^2 N^{-1} m^{-2}$.

5. (a) What is LASER? With necessary diagram explain the construction and working of Ruby laser. [6

   (b) State Gauss' divergence theorem. [2

6. (a) Write down Maxwell's electromagnetic equations in differential form and state the fundamental laws of electromagnetism with which they are associated. Using them derive the electromagnetic wave equation in terms of electric vector when the wave is passing through vacuum [6

   (b) Show that curl (div of a vector field) is zero. [2

7. (a) State Ampere's circuital law. Explain its modification due to displacement current. Derive the corresponding Maxwell's electromagnetic equation and hence show that it follows equation of continuity. [6

   (b) Show that position vector is irrotational. [2

8. Write short notes on. [3+3+2

   (a) Double refraction

   (b) Spontaneous and stimulated emission

   (c) Malus law

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