Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | | |

Odd Semester Examination-2016

B.Tech. (Semester-I)

ENGINEERING PHYSICS

[Time : 3 Hours] [Maximum Marks :100]

Note : Attempt **all** questions. The marks assigned to each question are indicated at question itself.

1. Attempt **any four** questions : [5×4=20]

(a) A vector in system S` is represented by $6\hat{i}+9\hat{j}+6\hat{k}$. How can the vector be represented in system S, while S` is moving with velocity $0.8c\hat{j}$ with respect to S? $\hat{i}, \hat{j}$ and $\hat{k}$ are the unit vectors along the respective directions.

(b) The mass of a moving electron is 11 times its rest mass. Calculate its kinetic energy, total energy, mass and momentum.

(c) Define the proper length and relativistic length. Derive the relation for length contraction using Lorentz Transformation equations.

(d) Obtain Einstein's mass energy relation. Give some evidence showing its validity.

(e) State Kirchhoff's law connecting to emissive and absorptive power of bodies for heat rotation. Plot the energy spectrum of Black body radiation at temperature T = 2000K, 2500K and 3000K

(f) An x-ray photon of initial frequency $3.0 \times$ Hz collides with an electron and is scattered through 90^0. Find its new frequency. Explain why Compton shift is not observed with visible light.

2. Attempt **any four** questions : [5×0]

(a) If the diameter of the n^{th} dark ring in an arrangement giving Newton's ring changes from 0.3 cm to 0.25 cm as liquid is introduced between the lens and the plate, calculate the value of the refractive index of liquid and also calculate the velocity of light in the liquid.

(b) Discuss the effect of introducing a thin mica sheet in the path of one of the interfering beam in an experiment. Deduce an expression for the displacement of fringes.

(c) Drive the expression for constructive and destructive interference in thin films of uniform thickness as seen by reflected light.

(d) What do you understand by missing order spectra in case of grating? What particular spectra would be absent if the width of transparencies and opacities of the grating are equal?

(e) How many orders will be visible if the wavelength of the incident radiation is 6000 Å and the numbers of lines on the grating is 2620 in one inch.

(f) In a grating the sodium doublet (5890Å, 5896Å) is viewed in the third order at 30^0 to the normal and is resolved. Determine the grating spacing and the total width of the rulings.

3. Attempt **any two** questions : [10×2=20]

(a) Using a Nicol prism and a quarter wave plate how will you produce and detect the Plane polarised, circularly polarised and elliptically polarised light.

(b) Explain the Absorption, Spontaneous Emission and Stimulated Emission. Discuss the Einstein's coefficients. Derive the relation between them.

(c) What is specific rotation? Describe the construction and working of Laurent's half shade polarimeter.

4. Attempt **any two** questions : [10×2=20]

(a) Write the Maxwell's equations in free space, dielectric medium and conducting medium. Discuss the propagation of electromagnetic waves in free space and hence prove that the light waves are electromagnetic waves.

(b) What is hysteresis curve? Explain this curve for ferromagnetic materials on the basis of domain theory. Hence explain the term retentivity, coercivity and hysteresis loss. How would you use the hysteresis curves to select material for the construction of permanent magnet?

(c) Define Poynting Vector. Derive an expression for it and explain its physical significance.

5. Attempt **any two** questions : [10×2=20]

(a) What is meant by superconductivity? Explain Meissner effect. A superconducting tin has critical temperature of 3.7 K and a critical field of 0.0306 T at 0 K. Find the critical field at 3 K.

(b) Solve Schrodinger wave equations for a particle in one dimensional rigid box of side L and having potential energy (V) as follows :

$V(x) = \infty$ for $x<0$ and $x>L$

$V(x) = o$ for $0 \leq x \leq L$

Find the wave function and energy eigen value.

(c) State the Heisenberg's uncertainty principle. Apply it to prove the non-existence of the electron in the nucleus. A nucleon is confined to a nucleus of diameter 2×10^{-14} m. Calculate the minimum uncertainty in the momentum of the nucleon. (Mass of nucleon is 1.67×10^{-27} kg).

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