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

Paper ID : 181504 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. I) THEORY EXAM. 2015-16

ENGINEERING PHYSICS-I

[Time : 3 hours] [Total Marks : 100]

SECTION - A

1. Attempt **all** parts. all parts carry equal marks. Write answer of each part in short. (2x10=20)

   (a) How the negative results of Michelson-Morley experiment interpreted ?

   (b) Find relativistic relation between energy and momentum.

   (c) If uncertainty in the position of a particle is equal to de Broglie wavelength, what will be uncertainty in the measurment of velocity ?

   (d) Write the characteristics of wave function,

   (e) Why the center of Newton's ring is dark ?

   (f) Define plane fo polarization and plane fo vibaration.

   (g) Define optic axis of doubly refracting crystal.

   (h) What is Rayleigh's criterion of resolution?

   (i) Define metastable state.

   (j) Give few importat applications of optical fibre.

SECTION-B

Note : Attempt any **five** questions. (5×10=50)

2. What do you mean by proper length? Derive the expression for relativistic length. Calculate the percentage contraction of a rod moving with a velocity of 0.6c in a direction inclined at 30° to its own length.

3. Show that the relativistic invariance of the law of conservation of momentum leads to the concept of variation of mass with velocity.

4. State Heisenberg's uncertainty principle. Prove that electron cannot exist inside the nucleus and proton can exists.

5. Explain the physical significance of wave function. Derive Schrodinger's time independent wave equation.

6. Explain the formation of Newton's? if in a newton's rings experiment, the air in the interspace is replaced by a liquid of refractive index 1.33 in what proportion would the diameter of the rings changed?

7. Discuss the phenomenon of diffraction at a single slit and show that intensities of successive maxima are

$$1:\frac{4}{9\pi^2}:\frac{4}{25\pi^2}:\frac{4}{49\pi^2}$$

8. Discuss the construction and working of a He-Ne laser. Compare it with Ruby Laser.

9. Describe the basic principle of communication of wave in optical fibre. A step index fibre has core refractive index 1.468, cladding refractive index 1.462. Compute the maximum radius allowed for a fibre, if it supported only one mode at a wavelength 1300 nm.

SECTION-C

Note: Attempt any **two** questions from this section.(2×15=30)

10. (a) Derive the Galilean transformation equations and show that its acceleration components is invariant.

    (b) If the kinetic energy of a body is twice its rest mass energy, find its velocity.

    (c) Explain de-Broglie's hypothesis. Discuss the outcome of Davisson-Germer's experiment in detail.

11. (a) Explain the phenomenon of interference in thin film due to reflected rays.

    (b) A diffraction grating used at normal incidence gives a yellow line (λ=6000Å) in a certain spectral order superimposed on a blue line (λ=4800Å) of next higher order. If the angle of diffraction is $\sin^{-1}(3/4)$, calculate the grating element.

    (c) Describe the construction and working of Nicol prism.

12. (a) Prove that $v_p x v_g = c^2$. Where v_p =phase velocity and v_g =group velocity.

    (b) Discuss the fifferent types of optical fibre in detail.

    (c) In a Ruby laser, total number of Cr^{+3} is 2.8×10^{19}. If the laser emits radiation of wavelength 7000Å calculate the energy of the laser pulse.

Physical Constants :

Mass of electron	$m_0 = 9.1\times10^{-31}$ kg
Mass of proton	$m_p = 1.67\times10^{-27}$ kg
Speed of light	$c = 3\times10^{8}$ m/s
Planck's Constant	$h = 6.63\times10^{-34}$ J/s
Charge on electron	$e = 1.67\times10^{-27}$ kg
Boltzmann's Constant	$k = 1.38\times10^{-23}$ m^2 kg s^{-2}k^{-1}

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