(b) Describe the construction and working of a Coolidge tube. How can you control : 3

(i) The intensity

(ii) The quality of X-rays ?

(c) Distinguish between hard and soft X-rays. 2

Section D

7. (a) Discuss the propagation of plane monochromatic electromagnetic waves in the conducting media. Derive the dispersion equation and thus obtain : 6

(i) Phase velocity

(ii) Refractive index

(iii) Skin depth.

(b) Define pointing vector. Derive an expression and explain its physical significance for electromagnetic wave in free space. 4

8. (a) Explain the concept of Cooper pairs formations in superconductors and BCS theory for superconductivity. What do you mean by coherence length ? 4

(b) Derive an expression for London equation in superconductivity. 4

(c) Discuss Type-I and Type-II superconductors. 2

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July-22-00209

B. Tech. EXAMINATION, 2022

Semester II (CBCS)

ENGINEERING PHYSICS

PH-101

Time : 3 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory.

Section A

1. What was the objective of conducting the Michelson-Morley experiment ? Describe the experiment in detail. How are the negative results of experiment interpreted ? 10

2. (a) What do you understand by Solid State Laser ? Describe the principle, construction and working of Ruby Laser. 5

(b) Explain the term 'absorption', 'spontaneous' and 'stimulated' emission of radiation. Obtain a relation between transition probabilities of spontaneous and stimulated emission. 5

Section B

3. (a) Derive an expression for the energy of a harmonic oscillator of mass m, amplitude A, and frequency ν. Find out the displacement at which energy is half kinetic and half potential. 6

(b) A particle is executing SHM of amplitude 0.06 m and a period of 6 s. Find out the time taken by it in moving from one end of its path to a position 0.03 m from the equilibrium position on the same side. 4

4. (a) Discuss the physical significance of numerical aperture. How does it depend on the refractive indices of core and cladding ? 5

(b) A graded index fibre has a core diameter of 0.05 mm and numerical aperture of 0.22 at a wavelength of 8500 Å. What are the normalized frequency (ν_n) and number of modes guided in the core ? 3

(c) Can more than one signal be propagated in single mode fibre ? 2

Section C

5. (a) The uncertainty in the location of a particle is equal to its De-Broglie wavelength. Calculate the uncertainty in its velocity. 3

(b) Starting from the wave equation and introducing energy and momentum of the particle, obtain an expression for three dimensional time dependent Schrödinger's equation. 7

6. (a) Discuss the origin and mechanism of production of the continuous X-ray spectra. What is the source of energy of photon of continuous X-rays ? Show that the lowest wavelength limit of continuous X-ray spectra is inversely proportional to accelerating potential of X-ray tube. 5

(Compulsory Question)

9. (a) Can we apply Gauss's law to calculate the electric field due to electric dipole ? Explain. **4**

(b) Derive and explain the Meissner effect in superconductors. **4**

(c) What are the basic assumptions of Bose-Einstein statistics ? **4**

(d) Explain in brief about the following : **4**

(i) Population inversion

(ii) Pumping.

(e) Calculate the mass and speed of 2 MeV electrons. **4**