

2E2003

Roll No. _____

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2E2003**B. Tech. I Year II Semester (Main/Back) Examination-2014
203 Engg. Physics - II****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks (Back) : 24****Min. Passing Marks (Main) : 26****Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit - I

1. a) Give the formulation of time dependent Shrodinger's equation for a free particle. Discuss the interpretation of position, probability density and normalization of wave function. (4+2+2+2)
- b) A quantum particle confined to one dimensional box of width 'a' is known to be in its first excited state. Determine the probability of the particle in the central half. (6)

OR

1. a) Solve Shrodinger's wave equation for a particle in one - dimensional box. Discuss the various energy states. (4+4)
- b) X-rays of wavelength 0.2\AA are scattered from a target. Calculate the wavelength of X-ray scattered through 45° . Also find the maximum Kinetic energy of the recoil electron. (4+4)

Unit - II

2. a) Explain the following
 - i) Degeneracy,
 - ii) Order of degeneracy and
 - iii) Non - degeneracy state (2+2+2)
- b) A free particle is confined in a cubical box of side 'a' write the eigen values and eigen functions for an energy state represented by $n_x + n_y + n_z = 4$. (5+5)

OR

2. a) Define fermi energy. Derive an expression for fermi energy of a system of particles. (2+6)
- b) A beam of electron is incident on a potential barrier of height 5 eV and width 0.2nm. What should be the energy of electrons so that half of them are able to penetrate through the barrier? (8)

Unit - III

3. a) What is Coherence? Explain temporal and spatial Coherence. For the source to be spatial Coherent, find the condition for its size. (2+4+2)
- b) A step index optical fibre has a core radius of 30 μm ; $n_1 = 1.5$ and $n_2 = 1.47$. If the operating wavelength is 800 nm, find the no. of modes propagating through the fibre (8)

OR

3. a) A fibre having a core index of n_1 , cladding index n_2 used in a communication link. Prove that $NA = n_1 (2\Delta)^{1/2}$, where $\Delta = \frac{(n_1 - n_2)}{n_1}$ (8)
- b) Calculate temporal Coherence length for
- i) Mercury vapor lamp emitting in green portion of spectrum at Wavelength of 546.1 nm with emission band width of $\Delta\nu = 6 \times 10^8 \text{ Hz}$. (4)
- ii) A helium neon laser operating at wavelength of 632.8 nm. (4)

Unit - IV

4. a) What are the basic requirements of semi conductor laser? Draw its label diagram and explain its working with necessary theory. Write down the applications of semiconductor laser. (2+4+2)
- b) What is the fundamental principle of a hologram? How is it produced and how is image constructed from it? (4+4)

OR

4. a) Explain the term absorption, spontaneous emission and stimulated emission and derive a relation between Einstein's Coefficients. (2+2+2+4)
- b) What is holographic microscopy? With illustrative diagram show outlay of a holographic interferometer and explain its working. (2+2+2)

Unit - V

5. a) Draw a labelled diagram of proportional counter and explain its use in detection of α , β , soft x-rays and γ -rays. (2+6)
- b) A G.M. Counter has a plateau slop of 3% per 100 volts. If the operating point is at 1100 volts. What is the maximum permissible voltage fluctuation in the counting is not affected by more than 0.1%? (8)

OR

5. a) Explain the principle of particle detection. Draw log n - v graph showing different regions and discuss the significant physical processes taking place in these regions. (2+6)
- b) An α - particle loses all its energy in producing 15×10^4 electron-ion pairs in the ionization chamber. 35eV energy is required to produce an electron - ion pair. What is the Kinetic energy of the α -particle? Calculate the amount of charge collected by each plate. (4+4)