

2E2003

Roll No. _____

Total No of Pages: **3****2E2003****B. Tech. II-Sem. (Back) (Back) Exam., Oct.-Nov. - 2020****203 Engineering Physics - II****Time: 2 Hours****Maximum Marks: 48****Min Passing Marks: 15***Instructions to Candidates:*

Attempt three questions, selecting one question each from any three 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. Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL2. NIL**UNIT- I**

- Q.1 (a) What is Compton Effect? Derive an expression for Compton Shift. [8]
- (b) Derive an expression for the time dependent Schrödinger equation and differentiate between ψ & $|\psi|^2$. [6+2=8]

OR

- Q.1 (a) What do you mean by a particle in a box? Show that the energy of an electron in a box varies as the square of the natural numbers. [2+6=8]
- (b) Calculate the change in wavelength of X - ray photon, when it is scattered through an angle of (i) 60° (ii) 90° (iii) 180° by a free electron. [8]

UNIT- II

- Q.2 (a) What is tunnel effect? Write down Schrödinger equation for potential barrier problem and steps to find out the transmission coefficient of a particle having less energy than the height of potential barrier. [2+6=8]
- (b) Explain the following – [4+4=8]
- (i) Degeneracy
 - (ii) Alpha Decay

OR

- Q.2 (a) Write down basic postulates of Sommerfeld's free electron gas model and obtain an expression for the density of states for free electron gas in metals. [3+5=8]
- (b) The Fermi energy of sodium is 3 eV. Calculate the difference in energy between the neighboring levels at the highest energy state in a cubical box of side 1cm. [8]

UNIT- III

- Q.3 (a) What is coherence? Explain spatial and temporal coherence. Obtain the relation between spectral purity factor and coherence length. [2+4+2=8]
- (b) Calculate the numerical aperture, acceptance angle and the critical angle of a fibre having core refractive index 1.5 and the cladding refractive index 1.45. [8]

OR

- Q.3 (a) What are the factors which affect the light propagation through an optical fiber? Derive an expression for the numerical aperture of an optical fibre. [2+6=8]
- (b) Find the coherence length and coherence time for white light, the wavelength of white light ranges from 400 nm to 700 nm. [8]

UNIT- IV

- Q.4 (a) What are various components of a laser? Explain the construction and working of He – Ne laser with suitable diagrams. [2+6=8]
- (b) Derive the relation between Einstein coefficients. [4]
- (c) Explain construction and reproduction of a hologram with suitable diagram. [4]

OR

Q.4 (a) Explain the following terms-

[2+2+2+2=8]

- (i) Metastable states
 - (ii) Optical pumping
 - (iii) Population Inversion
 - (iv) Stimulated emission
- (b) Explain the working of holographic microscopy and holographic Interferometer. [8]

UNIT- V

- Q.5 (a) Discuss G. M. counter in detail and explain the terms dead time, recovery time and paralysis time. [8]
- (b) A G. M. counter has a plateau slope of 3% per 100 volts. If the operative point is at 1100 volts, what is the maximum permissible voltage fluctuation, if the counting is not to be affected by more than 0.1% [8]

OR

- Q.5 (a) Describe the construction, working and applications of scintillation counter. [8]
- (b) Draw a labelled diagram of proportional counter and explain its uses in detection of α , β and γ - rays. [8]

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