

First/Second Semester B.E. Degree Examination, June/July 2016
Engineering Physics

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
 2. Physical Constants: Planck's constant $h = 6.63 \times 10^{-34}$ JS, Mass of electron $m = 9.11 \times 10^{-31}$ kg, Boltzmann constant $K = 1.38 \times 10^{-23}$ JK⁻¹, Avogadro number $N_A = 6.025 \times 10^{26}$ /K mol, Velocity of light $C = 3 \times 10^8$ ms⁻¹.

Module-1

1. a. Mention the assumptions of Planck's law. Arrive at the relation for Wien's law from Planck's law. (06 Marks)
- b. State Heisenberg's uncertainty principle. Show that electrons cannot exist inside the nucleus. (06 Marks)
- c. Calculate the deBroglie wavelength associated with neutron of mass 1.674×10^{-27} kg with one tenth part of the velocity of light. (04 Marks)

OR

2. a. What is phase velocity and group velocity? Show that group velocity is equal to particle velocity. (06 Marks)
- b. Obtain normalized wave function, with respect to a particle inside an one dimensional potential well. (06 Marks)
- c. An electron is bound in one dimensional potential well of width 0.18 nm. Find the energy value in eV of the second excited state. (04 Marks)

Module-2

3. a. Explain the failure of classical free electron theory. (06 Marks)
- b. State law of mass action and derive the expression for electrical conductivity of a semiconductor. (06 Marks)
- c. A superconducting tin has a critical field of 306 gauss at 0 K and 217 gauss at 2 K. Find the critical temperature of superconducting tin. (04 Marks)

OR

4. a. What is Fermi factor? Discuss the variation of fermifactor with temperature. (06 Marks)
- b. Write a note on High temperature super conductors. (06 Marks)
- c. Calculate the mobility of electrons in copper assuming that each atom contribute one free electron for conduction. Resistivity of copper = 1.7×10^{-8} Ωm, atomic weight = 63.54, density = 8.96×10^3 kg/m³. (04 Marks)

Module-3

5. a. Explain the construction and working of semiconductor laser. (06 Marks)
- b. Discuss the three different types of optical fibres. (06 Marks)
- c. The ratio of population of two energy levels out of which one corresponds to metastable state is 1.059×10^{-30} . Find the wavelength of light emitted at 330 K. (04 Marks)

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