USN

15PHY12/22

# First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017 **Engineering Physics**

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer FIVE full questions, choosing one full question from each module. 2. Physical Constants: Velocity of light, c = 3 × 108 ms. 1.

Planck's constant,  $h = 6.625 \times 10^{-34}$  J.S. Mass of electron,  $m_e = 9.1 \times 10^{-31} \text{ kg}$ . Avogadro number,  $N_A = 6.02 \times 10^{26} / \text{Kmol}$ , Boltzmann constant,  $k = 1.38 \times 10^{-23}$  J/K. Charge of an electron,  $e = 1.602 \times 10^{-19}$  C

#### Module-1

- a. State Planck's radiation law. Show how Planck's law could be reduced to Wien's law and 1 Rayleigh-Jeans law, 607 Marksh
  - b. State Heisenberg's uncertainty principle and show that electron does not exist inside the nucleus by this principle. (05 Marks)
  - c. Find deBroglie wavelength of a particle of mass 0.58 MeV/c2 has a kinetic energy 90 eV, where c is velocity of light. (04 Marks)

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- Using Schrodinger's time independent wave equation obtain eigen values and eigen function for a particle in a one dimensional potential well of infinite height.
  - b. Define phase velocity and group velocity. Show that group velocity is equal to particle (05 Marks).
  - c. The inherent uncertainty in the measurement of time spent by Iridium 191 nuclei in the excited state is found to be 1.4 × 10<sup>-10</sup> s. Estimate the uncertainty that results in its energy in eV in the excited state. (04 Marks)

## Module-2

- 3 Explain Meissner effect. Write any three differences between Type-I and Type-II superconductors. (07 Marks)
  - Explain the failure of classical free electron theory.

(05 Marks)

For intrinsic Gallium Arsenide, the electric conductivity at room temperature is 10-6 ohm-1 m-1. The electron and hole mobilities are respectively 0.85 m2/V.S and 0.04 m<sup>2</sup>/V.S. Calculate the intrinsic carrier concentration at room temperature. (04 Marks)

#### OR

- State law of mass action. Obtain an expression for electrical conductivity of semiconductors. co7 Marks)
  - Explain the BCS theory of super conductivity.

(05 Marries)

Calculate the probability of finding an electron at an energy level 0.02 eV above Fermi level at 200 K. (04 Marks)

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