VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

School of Electronics Engineering (SENSE)

CAT- I, Fall Semester 2018-19

B.Tech

Course Name :Introduction to Nanoscience and Nanotechnology
Course Code :ECE1006
Time :9:30 to 11 am (17/08/18)
Class No: VL2018191003461, VL2018191002820, VL2018191002586
Slot : E1
Faculty : Dr. Sakthi Swarrup J, Dr. Niroj Kumar Sahu, Dr. Muthu Raja S

Duration : 90 min.
Max. Marks: 50

Answer ALL the questions

Differentiate between insulator, semiconductor and conductor giving at least two examples of each type. Explain with proper diagram the formation of band in Silicon (Si) crystal taking into the consideration of hybridization concept. [12]

A) The electrons cannot exist inside the nucleus. Explain it by using quantum principles. [2]

B) When does light behaves like a wave and when a particle? [2]

C) Calculate the de Broglie wavelength associated with an electron of energy 150 eV. Given: mass of electron $m = 9.1\times10^{-31}$ Kg, charge of electron is $q = 1.6 \times 10^{-19}$ coulomb, and Planks constant $h = 6.62 \times 10^{-34}$ Joule-sec. [4]

Consider an electron trapped in a 1D deep potential well. Derive the expressions of the quantized energy states of the electron by solving Schrodinger's equation. [10]

Explain the properties that make nanomaterials different from bulk? Discuss the change in optical and electronic properties with respect to particle size. [10]

Differentiate between the basic particles in quantum statistics? Explain the difference in Fermi-Dirac and Bose-Einstein's distribution using Pauli's exclusion principle [10]