SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

ADITYA SILVER OAK INSTITUTE OF TECHNOLOGY

BE - SEMESTER–I • MID SEMESTER-I EXAMINATION – WINTER 2018

SUBJECT: PHYSICS (3110018) (SOFT BRANCHES - CE/IT/ etc...)

DATE: 05-10-2018   TIME: 02:00 pm to 03:30 pm   TOTAL MARKS: 40

Instructions: 1.Q. 1 is compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Give Answer with most suitable/correct option. [05]

(i) Superconductors are perfect
(a)Diamagnetic (b)Ferromagnetic (c) Paramagnetic (d) Dielectric

(ii) Type 1 superconductors have ….......critical magnetic field.
(a) 1   (b) 0   (c) 1/2   (d) 2

(iii) Density of energy states varies as
(a) $E^{1/2}$ (b) $E^{-1/2}$ (c) $E^{3/2}$ (d) $E^{2/3}$

(iv) What is probability that energy state is occupied at $E = E_f$
(a) 1   (b) 0   (c) infinite   (d) 1/2

(v) Mobility is defined as ….............per unit electric field.
(a) average flow of electrons   (b) average applied electric field
(c) average drift velocity   (d) conductivity

Q.1 (b) What do you mean by direct and indirect energy band gap? [05]

Q.2 (a) What are superconductors? Explain properties of superconductors [06]

(b) Show that occupation probability at $E = E_F + \Delta E$ is same as non occupation probability at $E = E_F - \Delta E$, where E_F is the Fermi energy. [05]

(c) The critical temperature for a metal with Isotopic mass of 199.5 u is 4.185 K. Calculate the isotopic mass if the critical temperature falls to 4.133 K. [04]

OR

Q.2 (a) Describe Kronig Penny model to explain energy band diagram. [06]

(b) Derive an expression for Density of states for conduction electron for unit volume of metal. [05]

(c) Explain the mechanism of superconductivity or BCS theory in detail. [04]

Q.3 (a) Write a short note on maglev train and Cryotron. [06]

(b) Calculate the critical current for a superconducting wire of lead having a diameter of 1mm at 4.2k. Critical temperature for lead is 7.18k and $H_{c(0)} = 6.5 \times 10^4$ A/m. [05]

(c)   Explain energy band formation in Silicon.   [04]

OR

Q.3   (a)   Define effective mass. Draw E-k diagram and explain significance of k in E-k diagram.   [06]

(b)   Explain Josephson junction and its applications (SQUID) in detail.   [05]

(c)   What is Fermi energy? Discuss variation of Fermi factor with energy and temperature.   [04]