

**B TECH**  
**(SEM II) THEORY EXAMINATION 2017-18**  
**ENGINEERING PHYSICS II**

Time: 3 Hours

Total Marks: 100

- Note:** 1. Attempt all Sections. Assume any missing data suitably.  
2. Section A, Section B and Q3, Q4, Q5 are common to all. In Section C, Q6 and Q7 attempt only the questions relevant to your group.

## SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. What do you mean by tunneling effect?
  - b. Explain Meissner effect in superconductors.
  - c. What are de-Broglie matter waves?
  - d. Explain super conductivity.
  - e. List any four applications of nano-materials.
  - f. What are the use dielectric properties of materials?
  - g. Describe polarizability.
  - h. Write the statement of ClaussiusMossotti equation.
  - i. What is the use of bulky balls?
  - j. List the uses of carbon nanotubes.

## SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Prove that the phase velocity of de-Broglie waves is  $v/2$  when particle velocity  $v$  is small compared with the velocity of light and  $c^2/v$  when particle velocity is comparable with velocity of light.
  - b. Describe the type I and type 2 superconductivity. Also discuss the effect of magnetic field on super conductivity.
  - c. Discuss the structure and properties of carbon nano tubes.
  - d. What is the meaning of polarization of dielectric? Describe different types of polarization.
  - e. Explain the Langevin's theory for diamagnetic and paramagnetic materials.

## SECTION C

- 3. Attempt any one part of the following: 10 x 1 = 10**
- (a) Calculate the uncertainty in the velocity of an electron, which is, confined in a  $10^\circ$  A box.
  - (b) A superconducting material has a critical temperature of 3.7 K in zero magnetic field of 0.306 Tesla at 0 K. Find the critical field at 2 K.
- 4. Attempt any one part of the following: 10 x 1 = 10**
- (a) Calculate the electronic polarizability of Argon atom. At N.T.P. the dielectric constant of Argon is 1.0024 and its atomic density is  $2.7 \times 10^{25}$  atoms/m<sup>3</sup>.
  - (b) What are buckyballs? How can the buckyballs be created? Where are these buckyballs used?

5. **Attempt any one part of the following:** **10 x 1 = 10**  
(a) Derive Schrodinger time independent and time dependent equations for matter waves.  
(b) Describe the phenomenon of hysteresis and its applications.

6. **Attempt any one part of the following:** **10 x 1 = 10**  
**For students of CS/IT group:**  
(a) Describe the Fermi-Dirac probability distribution function and Fermi energy level and their significance.  
(b) What is a solar cell? Discuss its construction and working on the basis of energy band diagram.

**For students of EE/EC group**

- (a) What do you understand by photovoltaic effect? Describe the working of a solar cell with suitable diagram. Also give applications of solar cells.  
(b) Discuss the theory of Joule-Thomson expansion. Describe the adiabatic demagnetization.

**For students of ME/AU/MT/CH/CE/EV/ TT/TE/TC/FT etc.**

- (a) Define atomic radius. Calculate atomic radius in case of SC, BCC and FCC structures.  
(b) Differentiate between enthalpy and entropy. What is physical significance of entropy?

7. **Attempt any one part of the following:** **10 x 1 = 10**  
**For students of CS/IT group:**  
(a) What is 4-f coherent imaging system? Discuss its function.  
(b) Explain the liquid crystal spatial light modulator (SLM) principle and its working mechanism.

**For students of EE/EC group**

- (a) Describe the working of diffusion pump for producing low pressures. How are these low pressures measured?  
(b) Explain the construction and working of pin photodiode and avalanche photodiode with neat diagrams.

**For students of ME/AU/MT/CH/CE/EV/TT/TE/TC/FT etc.**

- (a) Describe the generation of high pressure using hydraulic system and using Diamond Anvil system.  
(b) What are ultrasonic waves? Explain how ultrasonic waves are produced using magnetostriction method.

*Physical Constants:*

*Mass of electron  $9.1 \times 10^{-31}$  kg*

*Speed of Light  $3 \times 10^8$  m/s*

*Planck's constant  $6.63 \times 10^{-34}$  J-s*

*Mass of Proton  $1.67 \times 10^{-27}$  kg*

*Permeability of free space  $4\pi \times 10^{-7}$  H/m*

*Permittivity of free space  $8.854 \times 10^{-12}$  F/m*

*Avogadro's number  $6.023 \times 10^{23}$  per mole*