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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T2 EXAMINATION - OCTOBER 2019

B.Tech VI Semester

COURSE CODE: 10B11PH611

MAX. MARKS: 25

COURSE NAME: Materials Science

COURSE CREDITS: 04

MAX. TIME: 1.5 Hour

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

- Q1. What is concept of two sublattice model in antiferromagnetic system? Show that for an oversimplified two sublattice model the Neel temperature is the same as the paramagnetic Curie temperature. [4-marks] [CO-1]
- Q2. Discuss the basic quantum theory of paramagnetism. How the Brillouin function is significant in the discussion of material magnetism. [4-marks] [CO-2]
- Q3. What is hysteresis? Draw the hysteresis curve for a ferromagnetic material. What is the importance of this curve in analyzing application of material magnetism? [4-marks] [CO-5]
- Q4. A system of electron spins is placed in a magnetic field of 2 weber/m<sup>2</sup> at a temperature T. The number of spins parallel to the magnetic field is twice as large as the number of antiparallel spins. Determine T. [4-marks] [CO-3]
- Q5. (a) If the molecular dipoles in a 10<sup>-3</sup> m radius water drop are pointed in the same direction, calculate the polarization. Dipole moment of water molecule is 6×10<sup>-30</sup> C-m. [3-marks] [CO-3]
- (b) What is local electric field for a cubic dielectric? With a help of a schematic show the difference between the Maxwell field and the local field. [2-marks] [CO-2]
- Q6. Discuss the different types of molecular weights in polymers. [4-marks] [CO-1]

Constants:  $\mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1}$ ; Avogadro number =  $6.023 \times 10^{23}$ ;  $m_e = 9.1 \times 10^{-31} \text{ kg}$ ;  $e = 1.6 \times 10^{-19} \text{ C}$ ;  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$ ; Density of water=1 g/cc; Molecular weight of water=18