

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-I Semester (CSE/IT/ECM)

COURSE CODE (CREDITS): Applied Materials Science

MAX. MARKS: 35

COURSE NAME: 18B1WPH532

COURSE INSTRUCTORS: PBB, VSA, SKT, HAZ

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. (a) Show that London equations defend the observation of penetration depth in superconducting thin films.

[4-marks][CO-2]

(b) Determine the critical field required to destroy the superconductivity at 5 K in Pb whose $T_C = 7.19$ K and $H_C(0) = 0.0803$ T.

[3-marks][CO-3]

(c) Determine the penetration depth in mercury at 0 K, if the critical temperature of mercury is 4.2 K and the penetration depth is 57 nm at 2.9 K.

[3-marks][CO-3]

Q2. (a) Differentiate between (i) number-average and weight-average molecular weights (ii) addition and step growth polymerization.

[4-marks][CO-4]

(b) Calculate the number-average molecular weight of a random nitrile rubber [poly(acrylonitrile C_3NH_3 -butadiene C_4H_6) copolymer] in which the fraction of butadiene repeat units is 0.30; assume that this concentration corresponds to a degree of polymerization of 2000.

[2-marks][CO-4]

(c) Polyethylene sample containing 4000 chains with molecular weights between 1000 and 4000 g/mol, 8000 chains with molecular weights between 6000 and 9000 g/mol, 7000 chains with molecular weights between 10,000 and 15,000 g/mol, and 2000 chains with molecular weights between 15,000 and 20,000 g/mol. Determine both number and weight average molecular weights.

[2-marks][CO-4]

Q3. (a) How the contribution of exchange energy is in contradiction to the contribution of magnetic field energy for the formation of domain structure?

[3-marks][CO-1]

(b) What is Slater rule for observing ferromagnetism in materials?

[3-marks][CO-2]

(c) Determine the magnetization and flux density in silicon, if its magnetic susceptibility is -4.2×10^{-6} and the magnetic field in it is 1.19×10^5 A/m. What would be the value of the relative permeability of the material?

[3-marks][CO-3]

(d) What is dot pitch and how does it correlate with pixel under different resolutions?

[2-marks][CO-4]

Q4. (a) Derive an expression for dipolar polarizability in dielectric materials.

[4-marks][CO-1]

(b) Explain the processing stages in the production of ceramics.

[2-marks][CO-5]