

End-Term Examination
(CBCS)(SUBJECTIVE TYPE)(Offline)
Course Name: B.Tech (CSE, IT, CSE-AI), Semester: III
(Nov-Dec, 2022)

Subject Code: BAS-201

Subject: MSE Material Sc and Engg

Time :3 Hours

Maximum Marks :60

Note: Q. 1 is compulsory. Attempt one question each from the Units I, II, III & IV.

Q1 **(5*4=20)**

- (a) Mention three Differences between metal and polymers along with some examples?
- (b) Lead in superconducting state has critical temperature of 6.2 K. The critical magnetic field at 0K is $0.064 \mu\text{Am}^{-1}$. Determine the critical field at 4K?
- (c) What are the characteristics of an implant material? Give some examples of polymer implant materials along with their area of application?
- (d) The lattice parameter for Fe is 0.2866 nm. What is the minimum angle of first order diffraction if a monochromatic radiation of 0.1790 nm is used?

UNIT-I

- Q2** (a) What are composite materials? Explain different composite matrix and their uses in different fields and appliances? **(5,5)**
- (b) What are ceramic materials? How is it different from other materials? Tabulate its general properties?

- Q3** (a) What are polymers? Justify their use in different industries with the help of suitable examples. **(5,5)**
- (b) Write a short note on the electrical and thermal conductivity of different materials such as metal, alloys, ceramics, polymers and composites?

UNIT-II

- Q4** (a) Two parallel plates having equal and opposite charges are separated by 2 cm thick slab of dielectric constant 3. If the electric field inside the material is 10^6 V/m . Calculate the Polarization vector and electric flux density? **(5,5)**
- (b) What are Piezoelectric Materials? Which inherent property of crystals becomes a reason for piezoelectricity (demonstrate using diagram)? Also mention reverse piezoelectric effect. (with examples)

- Q5** (a) A square germanium plate of parameters 10 mm, 10 mm, and thickness 1 mm, is placed in a magnetic field of 1.5 Wb/m^2 acting perpendicular to its thickness. If 1 mA current flows along its length, calculate the Hall voltage developed if the Hall coefficient is $3.5 \times 10^{-4} \text{ m}^3/\text{coulomb}$. **(5,5)**
- (b) What is the reason of magnetization of a material? Classify between the magnetic materials such as dia-, para-, ferro-, and anti-ferro-magnetic material depending upon their spin.

UNIT-III

- Q6** (a) What is an LED? How is it constructed? Explain the basic constituents of an LED light? **(5,5)**
- (b) What are photonic crystals? Explain the construction and properties of 1D, 2D, and 3D photonic crystals and their applications.

- Q7** (a) What are shape memory alloys? Explain the phenomenon and how it works? **(5,5)**
- (b) Explain chromic materials and their widely known variants like thermo-, photo-, and electro-chromic materials? **PTO**

UNIT-IV

- Q8** What is X-ray diffraction technique? Explain its principle including Bragg's law. Also Explain the Construction, and Working of an X-ray diffractometer (From the generation of X-rays to the selection of single wavelength, interaction with sample, and detection) with the help of a diagram (Bragg's geometry). (10)
- Q9** What is Raman Spectroscopy? Explain its principle with the help of energy level diagram, Rayleigh, stokes and anti-stokes lines, why stokes lines are higher in intensity? Also explain the construction of a Raman setup with the help of a diagram. (7,3) (10)