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Total number of printed pages – 2

B. Tech
BSMS 1213

Third Semester Back Examination – 2014

MATERIAL SCIENCE AND ENGINEERING

BRANCH (S) : AEIE, EC, EEE, EIE, ELECTRICAL, ETC, IEE

QUESTION CODE : L312

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.*



1. Answer the following questions :

2 × 10

- (a) Explain dielectric strength and dielectric breakdown.
- (b) From strain and stress graph, show the plastic deformation region.
- (c) Define magnetic susceptibility and write its units.
- (d) Write two applications of superconductors.
- (e) Prove that the probability of occupancy of an energy level by the electrons below Fermi level at 0K is 1.
- (f) What are different types of corrosion ?
- (g) What are the monomers of Nylon-66 and PVC ?
- (h) Write down four limitations of fatigue test.
- (i) Why Ceramics are brittle in nature ?
- (j) The dielectric constant of quartz is 1.55. Calculate the refractive index of the material.

2. (a) How the selection of materials is carried out for technological purposes ? 4
- (b) How can you measure the impact strength ? What is its S.I. unit ? 4
- (c) Differentiate between fatigue strength and fatigue limit. 2

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3. (a) Find an expression for electrical conductivity by using Ohm's law. 4
 (b) Derive the Widemann- Frenzt law. 3
 (c) A metallic wire of length 0.6 m and diameter 0.4mm has a resistance of 0.1 ohm at 300 K. Using the above data calculate the Lorentz number according to classical free electron theory of metals. (thermal conductivity of the metal at 300K is 380 W/mK) 3
4. (a) Distinguish between type -I and type -II superconductors. 4
 (b) Explain Meissner effect. Show that electric field inside a superconductor is zero. 3
 (c) Superconducting tin has a critical temperature of 4.7K at zero magnetic field and a critical field of 0.0206 Tesla at 0 K. Find the critical field at 4 K. 3
5. (a) What do you understand about polarization ? Write the equations of different types of polarizations. 3
 (b) How does the dielectric constant depend on temperature and frequency ? 4
 (c) The polarisability of argon is $1.8 \times 10^{-40} \text{ cm}^2/\text{V}$. Calculate the dielectric susceptibility of argon at NTP. 3
6. (a) What do you mean by Laser ? Explain the principles of operation of He-Ne laser. 5
 (b) Distinguish between Hard and Soft ferromagnetic materials. 3
 (c) Write the applications of ferrite. 2
7. (a) Distinguish between thermoplastic and thermosetting polymer. 4
 (b) Write the repeating unit of PMMA. The degree of polymerization of methyl methacrylate is 200. Calculate the average molecular weight of it. 5
 (c) Write two uses of Teflon. 1
8. (a) Discuss briefly the different types of fiber-reinforced composites. 5
 (b) Write notes on SMART and Nano phase material. 5

