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Total number of printed pages – 2

B. Tech  
BSMS 1209

**Third Semester Back Examination – 2014**

**MATERIAL SCIENCE**

**BRANCH (S) : CHEM, MME**

**QUESTION CODE : L 345**

**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) What are the important guidelines for selection of materials ?
  - (b) Write the postulates of quantum theory of free electrons.
  - (c) Define thermal conductivity and write its units.
  - (d) Explain dielectric breakdown.
  - (e) Mention two applications of ferrites.
  - (f) Distinguish between hard and soft ferromagnetic materials.
  - (g) Explain with block diagram the FOCL.
  - (h) Explain blow moulding.
  - (i) What are different types of corrosion ?
  - (j) What is fiber-reinforced composite ?
2. (a) Find an expression for electrical conductivity by using Ohm's law. 4
- (b) Derive the Widemann -Frentz law. 3
- (c) Give the band diagram of conductors, insulator and semiconductor. 3

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3. (a) Distinguish between type-I and type-II superconductors. 4
- (b) 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
- (c) Write three applications of superconductor. 3
4. (a) What do you understand by Polarization ? Write the equations of different types of Polarization and show graphically how the total Polarization behaves with the temperature. 4
- (b) How does the dielectric constant depend on temperature and frequency ? 4
- (c) Calculate the shift of electron clouds with respect to the nucleus in He atom when electric field of  $10^6$  volt / meter is applied. The polarizability of He is  $1.6 \times 10^{-40} \text{ F.m}^2$ . 2
5. (a) Distinguish between diamagnetic, Paramagnetic and Ferromagnetic materials. 4
- (b) Write the difference between soft and hard Ferromagnetic materials. 3
- (c) What do you mean by Laser ? State its different applications. 3
6. (a) Distinguish between thermoplastic and thermosetting polymer. 4
- (b) What is injection moulding and transfer moulding ? 4
- (c) Write two applications of optical fiber. 2
7. (a) Describe briefly the mechanism of electrochemical corrosion. 3
- (b) How commercial ceramic is classified ? Discuss the mechanical properties of ceramics. 4
- (c) Write a note on prevention of corrosion. 3
8. (a) Discuss briefly the different types of fiber-reinforced composites. 5
- (b) What do you mean by the matrix ? Explain metal matrix composites. 5