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Total number of printed pages – 2

B. Tech
BSMS 1213 (New)

Special Examination – 2012

MATERIAL SCIENCE AND ENGINEERING

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) When a material is said to be nano material ? What is its importance?
 - (b) Write down the clausius–mosotti equation. Explain the symbols.
 - (c) Explain the phenenomenon of spontaneous polarization in ferroelectric material.
 - (d) What is the Curie-Weiss law ? Give the significance of the law.
 - (e) Classify the magnetic material on the basis of their spin.
 - (f) Write notes on magnetic memory.
 - (g) Can a material have an index of refraction less than unity ? Why or why not ?
 - (h) What do you mean by degree of polymerization ?
 - (i) Define glass transition temperature.
 - (j) What do you mean by the micro composite and macro composite ?
2. (a) For copper at 20°C the electrical resistivity and thermal conductivity are 1.72×10^{-8} ohm .meter and $386 \text{ Wm}^{-1}\text{k}^{-1}$. Find the value of Lorentz number. 4
(b) Discuss classical free electron theory. Derive expression for electrical and thermal conductivity. 6
3. (a) What do you mean by superconductivity ? Describe the effect of :
 - (i) Magnetic field
 - (ii) isotopes on superconductors. 5
(b) Describe the principle of superconducting quantum interference device. List out their uses and their engineering application. 5



P.T.O.

4. (a) Draw temperature dependence of susceptibility at all type of magnetic materials. Comments on them. Explain the Heisenberg's exchange interaction in ferromagnetism. 5
- (b) A magnetic material has a magnetization at 3400 amperes / meter and flux density of 0.0044 wb / m². Calculate the magnetizing field and the relative permeability of material. 3
- (c) Explain the terms dielectric loss and dielectric break down Briefly describe the mechanism leading to dielectric break down. 2
5. (a) What are Metal-matrix composites (MMC) ? Describe the methods of preparing fiber – reinforced MMC ? 5
- (b) A polymer sample consist of 10% by weight of macromolecule of molecular weight 10000 and 90% by weight of macromolecule with molecular weight 100000. Calculate M_n and M_w . 5
6. (a) What are the Fiber-reinforcement composite (FRC) ? Explain the characteristics materials essential for design FRC. 5
- (b) What do you mean by the Vulcanization of rubber Discuss the advantage and application of vulcanization. 5
7. (a) What is polymerization ? With help of suitable example, compare and contrast and process of addition polymerization and condensation polymerization. 5
- (b) Write the short notes : 5×2
- (i) Stress corrosion
- (ii) Atmospheric corrosion
8. (a) Distinguish between stimulated and spontaneous emission. State the conditions for laser action in crystal. 3
- (b) Write the advantage of four level laser over 3 level laser. 3
- (c) What is fracture ? Discuss the different types of fracture that occurs in a material. 4

