Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B.Tech

BSMS1213

Third Semester Examination – 2013

MATERIAL SCIENCE AND ENGINEERING

BRANCH : ELECTRICAL, MARINE, AEIE, EEE, ETC, EIE, EC, IEE

QUESTION CODE : C- 498

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 important guidelines for selection of materials ?

   (b) A copper wire originally 305 mm long is pulled in tension with a stress of 276 MPa. Calculate the elongation by assuming purely elastic deformation .Given modulus of elasticity for Cu = 110,000 MPa.

   (c) Write down four limitations of fatigue test.

   (d) Distinguish between soft and hard superconductors.

   (e) The Fermi energy of silver at 0 K is 5.51 eV. What is the average energy of free electrons in silver at 0 K ?

   (f) Calculate the polarization of the He gas if placed in field of 6×10^5 V/m. The polarisability of helium is 0.18×10^{-40} Fm^2 and the concentration of the atoms is 2.6×10^{25} m^{-3}.

   (g) Mention four applications of ferrites.

P.T.O.

(h) Distinguish between spontaneous emission and induced emission.

(i) What do you mean by tacticity of polymer ?

(j) What is anisotropic composite

2. (a) How is selection of materials carried out for technological purposes ? 4

(b) Differentiate between engineering stress and true stress. 2

(c) How impact strength is measured? What is it's S.I unit ? 4

3. (a) Explain (i) Meissner Effect, (ii) Silsbee Effect. 5

(b) The superconducting critical temperature of mercury with isotopic mass 199.5 is 4.2 K .Calculate the superconducting critical temperature when its isotopic mass changes to 202.5. 2

(c) Estimate the shift of the electron cloud with respect to the nucleus in argon atom when a field of 10^5 V/m is applied. The polarisability of argon is 1.8×10^{-40} Fm^2. 3

4. (a) Two parallel plates of area 100 cm^2 are each given equal but opposite charges of magnitude 8.9×10^{-8} C .Within the dielectric material filling the space the plates ,electric field strength is 1.4×10^6 Vm^{-1}. Find the dielectric constant of the material filling the space between the two plates .Assume that two parallel constitute a parallel plate capacitor. 3

(b) Derive an expression for the electronic polarisability in terms of atomic radius. 4

(c) Calculate the critical current for a wire of lead having a diameter of 1 mm at 4.2 K. The critical temperature for lead is 7.18 K and $H_0 = 6.5 \times 10^4$ amp/m. 3

5. (a) Distinguish between soft and hard ferromagnetic materials. 2

(b) The dielectric constant of quartz is 1.55. Suppose a beam of photons in a vacuum strikes quartz crystal at an angle of 10^0 to the normal of the surface of this crystal. Find the angle of refraction. 4

(c) Write short note on Hysteresis. 4

6. (a) What do you mean by laser ? Explain, in detail, the principle of laser production. 4

(b) The magnetic susceptibility of a material at room temperature is 0.82×10^{-8}. Calculate its magnetization under the action of magnetic induction of 0.25 Tesla. 2

(c) Calculate the numerical aperature and acceptance angle of a fiber with a core index of 1.54 and a cladding index of 1.50. 2

(d) Distinguish between diamagnetic and ferromagnetic materials. 2

7. (a) Describe Briefly the different type of fiber–rein forced composite. 5

(b) What do you mean by ceramic ? Discuss its structure. 5

8. (a) Write the difference between the Thermoplastic and Thermosets. 5

(b) What do you mean by the Matrix ? Classify the composite Matrix on basis the matrix. 5