A   Reg. No. :

Question Paper Code: 52003

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Second Semester

Mechanical Engineering

15UPH203–MATERIAL SCIENCE

(Common to Chemical Engineering)

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. A dielectric can be made a conductor by   CO1- R
    (a) compression   (b) heating   (c) doping   (d) freezing
2. Find the dielectric constant for a material with electric susceptibility of   CO1 -R
    4
    (a) 3   (b)5   (c)8   (d)16
3. A semiconductor has ………… temperature coefficient of resistance   CO2- R
    (a) positive   (b) zero
    (c) negative   (d) both positive and negative
4. A hole in a semiconductor is defined as …………….   CO2 -R
    (a) a free electron   (b) the incomplete part of an electron pair bond
    (c) a free proton   (d) a free neutron
5. The magnetic field which destroys the superconductivity is called   CO3- R
    (a) diamagnetic field   (b) ferromagnetic field
    (c) ferrimagnetic field   (d) critical field
6. The magnetic susceptibility in a superconductor will be   CO3- R
    (a) postive   (b) negative   (c) zero   (d) infinity
7. When does metal transform into glass?   CO4- R
    (a) at Curie temperature   (b) at Critical temperature
    (c) at melting point of the metal   (d) at glass transition temperature

8. Which of the following can be used to prepare nano-powder and nano-particles   CO4- R

    (a) sol-gel technique   (b) plasma arching

    (c) CVD   (d) Electrodepostion

9. Failure due to excessive deformation is controlled by _____.   CO5- R

    (a) yield strength   (b) tensile strength

    (c) young's modulus   (d) all.

10. Creep rate in ternary stage _____.   CO5 -R

    (a) decreases   (b) constant.   (c) increases   (d) none

PART – B (5 x 2= 10Marks)

11. State Wiedemann Franz law.   CO1- R
12. State Fermi level.   CO2- R
13. What is Maglev? State its applications.   CO3- R
14. What are carbon nanotubes?   CO4- R
15. State path function.   CO5 -R

PART – C (5 x 16= 80Marks)

16. (a)   (i) Derive Claussius Mosotti relation.   CO1 -App   (10)

           (ii) Write short notes on electrical and thermal conductivity.   CO1- App   (6)

                              Or

    (b)   (i) What do you know about Dielectric materials?   CO1 -App   (4)

           (ii) Write short notes on Electrical susceptibility, dielectric constant and polarization.   CO1 -App   (12)

17. (a)   (i) Differentiate intrinsic and extrinsic semiconductor.   CO2- App   (6)

           (ii) Evaluate various factors in hall effect   CO2 -App   (10)

                              Or

    (b)   (i) Derive carrier concentration derivation in detail and variation of Fermi level with temperature.   CO2- Ana   (16)

18. (a)   (i) Explain in detail High Tc superconductors and list its applications.   CO3 -Ana   (16)

                              Or

    (b)   (i) Explain soft and hard magnets.   CO3 -Ana   (8)

           (ii) Write short notes on SQUID and Domain theory   CO3 -Ana   (8)

52003

19. (a) (i) Explain plasma arcing in detail..   CO4- U   (10)

       (ii) Write short notes on ball milling   CO4 -U   (6)

Or

(b) (i) Explain in detail about metallic glasses preparation, CO4 -Ana   (10)
properties and applications.

       (ii) Write short notes on CNT and its applications.   CO4- Ana   (6)

20. (a) (i) Explain the mechanism of creep.   CO5 U   (10)

       (ii) Write short notes on carnot cycle.   CO5 U   (6)

Or

(b) (i) Draw a standard creep curve and explain its reactions.   CO5 U   (10)

       (ii) Write short notes on Boyle's law and Charle's law.   CO5 U   (6)

52003