

B.E /B.TECH DEGREE EXAMINATIONS:MAY/JUNE 2014

(Regulation 2009)

Second Semester

CIVIL ENGINEERING

PHY102:Materials Science

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The Unit for Lorentz number is-----
 - a) $W\Omega K$
 - b) $W/\Omega K$
 - c) $W\Omega K^{-1}$
 - d) $W\Omega K^{-2}$
2. An electrical current in a superconducting ring will theoretically flow unchanged for:
 - a) several milliseconds
 - b) a second
 - c) several weeks
 - d) forever
3. Semi-conductors have _____ temperature coefficient of resistance
 - a) Negative
 - b) Positive
 - c) Both positive and negative
 - d) zero
4. In p-type semiconductors the majority carriers are
 - a) holes
 - b) electrons
 - c) Positive ions
 - d) Negative ions
5. Permanent magnets are made of
 - a) Soft magnetic materials
 - b) Hard magnetic materials
 - c) semiconductors
 - d) superconductors
6. Dielectric constant of vacuum is
 - a) infinity
 - b) 100
 - c) 1
 - d) 0
7. -----is the required cooling rate to avoid the crystallization of metallic glasses
 - a) 10^3 K/s
 - b) 10^4 K/s
 - c) 10^5 K/s
 - d) 10^6 K/s
8. Example for zero dimension nanomaterials is
 - a) Quantum well
 - b) Quantum wire
 - c) Quantum dot
 - d) Quantum material

9. A Thermal insulator is
 - a) Good conductor of heat and has high thermal conductivity
 - b) Poor conductor of heat and has high thermal conductivity
 - c) Good conductor of heat and has low thermal conductivity
 - d) Poor conductor of heat and has low thermal conductivity
10. For one dimension heat conduction in a plane wall the temperature distribution is
 - a) parabolic
 - b) linear
 - c) quadratic
 - d) logarithmic

PART B (10 x 2 = 20 Marks)

11. State the drawbacks of classical free electron theory of metals..
12. What is magnetic levitation?
13. State the properties of semiconductors..
14. What is Hall effect?
15. State the applications of ferrites.
16. Mention the various types of dielectric breakdown mechanisms.
17. What are shape memory alloys?
18. What is meant by electrodeposition?
19. Define coefficient of thermal conductivity.
20. Why nitrogen gas is filled in electric bulb?

PART C (5 x 14 = 70 Marks)

21. a) (i) Derive an expression for electrical conductivity of metals. (10)
(ii) What is meant by Fermi distribution function? (4)
(OR)
b) (i) State and explain the properties of superconductors. (10)
(ii) What is meant by Meissner effect? (4)
22. a) (i) Derive an expression for density of electrons in the conduction band of an intrinsic semiconductor. (10)
(ii) Explain a method to determine the bandgap of an semiconductor. (4)
(OR)
b) (i) Describe an experiment for the measurement of the Hall coefficient. (10)
(ii) Mention the important applications of Hall effect. (4)

23. a) (i) Explain the properties of dia, para and ferromagnetic materials. (10)
(ii) Distinguish between soft and hard magnetic materials. (4)

(OR)

- b) (i) Explain the electronic and ionic polarization mechanisms involved in a dielectric material.. (10)
(ii) List out any four applications of ferroelectric materials. (4)

24. a) (i) Explain the properties and applications of metallic glasses. (10)
(ii) What are the applications of shape memory alloys? (4)

(OR)

- b) (i) Discuss Ball milling and Pulsed laser deposition techniques that are used to synthesize nanomaterials.. (10)
(ii) Mention the applications of carbon nanotubes. (4)

25. a) (i) Derive an expression for the rectilinear flow of heat along a bar. (10)
(ii) How ventilation radiators were found to be more thermally efficient than traditional radiators? (4)

(OR)

- b) (i) Discuss the heat conduction through compound media. (10)
(ii) What is meant by thermal insulation in buildings? (4)
