B.E/B.TECH DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2014)

Second Semester

U14PHT203: MATERIALS SCIENCE

(Common to CSE/ECE/EIE & IT)

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The temperature at which the normal conductor becomes super conductor is called as   [K_1]

    a) Curie temperature   b) Super conducting transition temperature

    c) Neel temperature   d) Boiling temperature

2. If the time delay between absorption and emission is greater than 10^{-8} s, then it is called as   [K_1]

    a) Phosphorescence   b) Excitons

    c) Traps   d) Phonons

3. The change in shape of a material at low temperature by loading and regaining original shape on heating is known as [K₁]

   a) Pseudo elastic effect   b) Piezo electric effect

   c) Shape memory effect   d) Super elastic effect

4. The value of electron in conduction band in an intrinsic semi conductor is lying between [K₂]

   a) 0 to ∞ b) $-\infty$ to E_v

   c) $-\infty$ to $+\infty$ d) E_c to ∞

5. Identify which of the following statement is correct? [K₄]

   a) Electrical conductors are bad conductors of heat

   b) Thermal conductors are good electrical conductors

   c) All electrical conductors are good thermal conductors, all thermal conductors are not good electrical conductors

   d) No relationship between electrical conductors and thermal conductors

6. **Assertion (A):** All dielectrics are insulators [K₂]

   Reason (R): All insulators are not dielectric

   a) Both (A) and (R) are true; but (R) is the correct explanation of A.

   b) Both (A) and (R) are true; but (R) is not the correct explanation of A.

   c) (A) is true but (R) is false

   d) (A) is false but (R) is true

7. **Statement 1:** when the temperature of Para magnetic materials is less than curie temperature it becomes diamagnetic. [K₄]

   Statement 2: Ferrites are special cases of Ferri magnetic materials.

   a) Statement 2 correct; 1 wrong   b) Statement 1 correct; 2 wrong

   c) Both statements 1 & 2 are correct d) Both statements 1 & 2 are wrong

8. **Statement 1:** Twisted nematic display used in LED [K₁]

   Statement 2: Dynamic scattering display used in LCD

   a) Statement 1 correct; 2 wrong   b) Both statements 1 & 2 are wrong

   c) Both statements 1 & 2 are correct d) Statement 2 correct; 1 wrong

9. Match the following: [K₄]

Type	Example
A. Intrinsic semi conductor	i. P - type
B. Extrinsic semi conductor	ii. GaAs
C. Compound semi conductor	iii. Aluminium

D. Conductor	iv. Germanium

a) A – iv B – i C – ii D – iii   b) A – iii B – i C – ii D – iv

c) A – i B – ii C – iii D – iv   d) A – ii B – iii C – i D – iv

10. Matching type item with multiple choice code   [K_2]

C – C bond	Structure
A. Parallel to tube axis	i. Zig zag
B. Perpendicular to tube axis	ii. Chiral
C. inclined to tube axis	iii. Arm chair

	A	B	C
a)	i	ii	iii
b)	iii	i	ii
c)	ii	iii	i
d)	iii	ii	i

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Recall Wiedemann Franz law.   [K_1]

12. Differentiate between Type I and Type II super conductors.   [K_2]

13. Distinguish ordinary mass (m) and effective mass (m*) of an electron.   [K_4]

14. A n-type semi conductor specimen has hall coefficient $R_H = 3.66 \times 10^{-4}$ m^3/coulomb. The [K_4] conductivity of the specimen is found to be 112 ohm^{-1}m^{-1}. Calculate the charge carrier density n_e and the electron mobility at room temperature.

15. Recognize ferrites with examples.   [K_1]

16. Write Langevin-Debye equation and mention its significance.   [K_1]

17. List four properties of metallic glasses.   [K_1]

18. Compare top down and bottom up processes.   [K_2]

19. Define excitons.   [K_1]

20. Compare trapping centre and recombination centre.   [K_2]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Deduce an expression for density of energy states and carrier concentration in metals. Also apply it to deduce an expression for Fermi energy at OK. [K$_3$]

22. i) You are given a semi conductor material. How will you conclude whether the given semi conductor is n-type or p-type? (10) [K$_4$]

    ii) Find the intrinsic carrier concentration of Germanium at 400 K. E$_g$ for Ge is 0.67 eV. Given $m_e*/m_0 = 0.12$ and $m_h*/m_0 = 0.28$. (4)

23. i) Explain domain theory of ferro magnetism. (10) [K$_2$]

    ii) Discuss dielectric loss. (4)

24. i) What are SMAs? Discuss the four characteristics associated with SMAs. (7) [K$_2$]

    ii) Explain Sol-Gel method of synthesizing nano materials with neat diagram. (7)

25. i) Describe the action of LCD in 3 modes. (10) [K$_2$]

    ii) Discuss optical phase conjugation. (4)

26. i) Validate $E_F = (E_V + E_A/2)$ by deducing the expression of carrier concentration for p-type semi conductor. (10) [K5]

    ii) Discuss the application of MAGLEV. (4)

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