KUMARAGURU
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B.E DEGREE EXAMINATIONS: JUNE 2017

(Regulation 2015)

Second Semester

CIVIL ENGINEERING

U15PHT201: Materials Science

COURSE OUTCOMES

CO1: Recognize the characteristics of sound and apply for good acoustics of building.

CO2: Acquire the knowledge of conducting and super conducting materials and applications.

CO3: Perceive the preambles of semiconductors and categorize its applications.

CO4: Categorize the different types of magnetic materials and their applications.

CO5: Enumerate the different types of polarization in dielectric materials.

CO6: Confer the properties ,preparation and application of modern engineering materials.

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match List I with List II and correct the answers with following codes.   CO1 [K_2]

List I	List II
A. Intensity of sound	i. Hertz
B. Absorption of sound	ii. Bel
C. Frequency of sound	iii. Sabine/m^2
D. Intensity level of sound	iv. W/m^2

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

2. If 20 m^2 of a floor absorbs the same amount of sound energy absorbed by 1 m^2 of open   CO1 [K_2]
    window then the absorption coefficient of floor is

    a) 0.05 OWU   b) 0.2 OWU

    c) 20 OWU   d) 5 OWU

3. Type – I superconductors have --------- critical field   CO2 [K₁]

   a) Two   b) One
   c) Three   d) Four

4. Magnetic susceptibility of diamagnetic materials are   CO4 [K₁]

   a) Small positive   b) Large positive

   c) Small negative   d) zero

5.   1. Ferroelectric materials are good conductors of electricity.   CO5 [K₂]

       2. Ferroelectric material exhibit spontaneous polarization.

       3. Ferroelectric material exhibit hysteresis.

       4. Ferroelectric material possesses small dielectric constant.

   Which of the above are correct?

   a) 1,3   b) 1,4
   c) 2,3   d) 3,4

6. During the increase in temperature, the conductivity of good conductors   CO2 [K₁]

   a) Increases then decreases   b) increases

   c) No change in conductivity   d) decreases

7. The following items consists of two statements, one labeled as the "Assertion(A)" and other   CO3 [K₂]
    as "Reason(R)".Examine these two statements and select the answers from the following
    Codes.

    Assertion (A): Semiconductors behave as insulators at 0 K.

    Reason(R):   Semiconductors have empty valence band and partially or completely filled
    conduction band at 0K.

   a) A is true but R is false   b) A is false but R is true

   c) A and R are individually true but R is not   d) A and R are individually true but R is
       the correct reason for A   the correct reason for A

8. The unit of Polarization is   CO5 [K₁]

   a) Farad metre^{-2} b) Coulomb/metre

   c) Coulomb/metre^{2} d) Metre/ Coulomb

9. Sequence the following sentences in the working of electrical conductivity of a metal   CO2 [K₂]

   1. The electric field is applied between two ends of the metallic rod.

    2. In the absence of external field, electron moves randomly in all directions.

    3. The current is produced in the metallic rod and the electrons acquire drift velocity.

    4. The electrons are move towards positive field direction.

   a) 3-1-4-2   b) 2-1-4-3

   c) 4-1-2-3   d) 3-1-2-4

10. The structure of Carbon Nano Tube is   CO6 [K$_1$]

   a) Orthorhombic   b) Monoclinic

   c) Chiral   d) Cubic

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. When the sound intensity level is increased by 1 dB, there is 26% of increase in Intensity. Prove the statement.   CO1 [K$_2$]

12. Mention the characteristics of sound.   CO1 [K$_1$]

13. State Wiedemann Franz law.   CO2 [K$_1$]

14. What will happen to the magnetic properties of a conductor during the superconducting transition?   CO2 [K$_2$]

15. Provide the importance of doping.   CO3 [K$_1$]

16. Discuss the term 'Negative temperature co efficient of resistance'   CO3 [K$_2$]

17. In a magnetic material the field strength is 10^6A/m, If the magnetic susceptibility of the material is 0.5×10^{-5}.Calculate the intensity of magnetization.   CO4 [K$_2$]

18. All the insulators are not dielectrics. Justify the sentence.   CO5 [K$_2$]

19. What do you mean by Quenching?   CO6 [K$_1$]

20. Classify the types of carbon nanotubes of based on the layers of graphene.   CO6 [K$_1$]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. (i) Derive an expression for density of energy states and based on that calculate the carrier concentration in metals.   (12) CO2 [K$_1$]

   (ii) The mobility of electron in copper is 3×10^{-3} m^2/Vs. Find the relaxation time of electron.   (2) CO2 [K$_1$]

22. Obtain an expression for carrier concentration in intrinsic semiconductors.   CO3 [K$_2$]

23. (i) How can you define Hall effect? Attain an expression for Hall co efficient for n- (10) CO3 [K$_2$]

      type and p-type semiconductors.

    (ii) Show the applications of Hall effect in various fields. (4) CO3 [K$_2$]

24. (i) Describe Ferro magnetic Hysteresis with neat sketch. (6) CO4 [K$_1$]

    (ii) Derive electronic and ionic polarization. (8) CO5 [K$_1$]

25. (i) Demonstrate in detail the synthesis of nano materials by following methods: (10) CO6 [K$_1$]

     a) CVD method   b) Plasma arcing

    (ii) Summarize any four properties of carbon nano tubes. (4) CO6 [K$_1$]

26. Outline the Growth of sound inside a hall and derive Sabine's formula for   CO1 [K$_2$]

    reverberation time

27. (i) Discuss the factors affecting acoustics of building and give their remedies. (8) CO1 [K$_1$]

    (ii) Relate an expression for absorption coefficient in terms of reverberation time of a (6) CO1 [K$_1$]

     new absorbing material introduced inside the hall.

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