

**B.E DEGREE EXAMINATIONS: DEC 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)**

- According to microscopic form of Ohm's law, the relation between electric field  $E$ , current density  $J$  and the conductivity  $\sigma$  is
  - $J = \sigma E^2$
  - $J = \sigma^2 E$
  - $J = \sigma EV$
  - $J = \sigma E$
- The transition temperature ( $T_c$ ) and isotopic mass of a super conducting element are related to each other as
  - $T_c M^3 = \text{constant}$
  - $T_c M^2 = \text{constant}$
  - $T_c M^{1/2} = \text{constant}$
  - $T_c M = \text{constant}$
- In a band structure of solid, width of allowed energy bands decreases with
  - decrease in the binding energy of an electron
  - increase in the binding energy of an electron
  - decrease in the kinetic energy of an electron
  - increase in the kinetic energy of an electron
- P type semiconductors are prepared by doping ----- impurities to a pure semiconductor
  - trivalent
  - divalent
  - tetravalent
  - pentavalent
- The net magnetic moment of an atom of a dia magnetic substance is
  - zero
  - infinity
  - positive and small
  - positive and large
- In a dielectric, the polarization is
  - exponential function of the applied electric field
  - linear function of the applied electric field



22. a) Prove that in the case of an intrinsic semiconductor the Fermi level is located exactly at the mid-point of forbidden energy gap.
- (OR)**
- b) (i) With necessary theory, show that for p-type semiconductor the Hall coefficient is  $1/ne$  where  $n$  represents density of holes. (10)
- (ii) List the applications of Hall effect. (4)
23. a) (i) On the basis of domain theory, explain the hysteresis effect in ferro magnetic materials. (10)
- (ii) Differentiate between hard and soft magnetic materials. (4)
- (OR)**
- b) (i) What is electronic polarization? Deduce a mathematical expression for electronic polarisability with necessary theory. (10)
- (ii) Write short notes on thermal break down. (4)
24. a) Give a detailed account on the various properties and applications of metallic glasses.
- (OR)**
- b) (i) Discuss the synthesis of carbon nanotubes by chemical vapor deposition (10)
- (ii) Bring out any four applications of carbon nanotubes (4)
25. a) (i) Describe an experiment to determine the thermal conductivity of the material of the rubber tube using radial flow of heat. (10)
- (ii) The total area of glass window pane is  $0.6 \text{ m}^2$ . Calculate how much heat is conducted per hour through the glass window pane if thickness of glass is 5 mm, the temperature inside is  $20^\circ \text{C}$  and of the outside of the surface is  $2^\circ \text{C}$ . Thermal conductivity of glass is  $1.1 \text{ Wm}^{-1}\text{K}^{-1}$ . (4)
- (OR)**
- b) Explain in detail the thermal insulation in buildings.

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