Enrollment No.....................................

Faculty of Engineering
End Sem (Odd) Examination Dec-2017
EE3ES09 / EX3ES09 Engineering Materials

Programme: B.Tech.   Branch/Specialisation: EE/EX

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which of the following is primary bond?   **1**
   (a) Dipole bond   (b) Hydrogen bond
   (c) Covalent bond   (d) Van der waals bond

   ii. The number of atoms per unit cell for face centred cubic structure is?   **1**
   (a) 1   (b) 2   (c) 3   (d) 4

   iii. Harden ability of steel is assessed by   **1**
   (a) Impact test   (b) Jominy end-quench test
   (c) Hardness test   (d) Non-destructive test

   iv. On heating, if one solid phase splits into two solid phases, the reaction is   **1**
   (a) Peritectoid (b) Eutectic   (c) Peritectic   (d) Eutectoid

   v. Which of following is true for SF_6 gas?   **1**
   (a) Non-toxic   (b) Arc-quenching property
   (c) Non-corrosive   (d) All of these

   vi. An ebonite is   **1**
   (a) Copolymer   (b) Natural wood
   (c) Natural rubber   (d) None of these

   vii. The temperature below which certain materials are ferromagnetic and above which they are paramagnetic is called   **1**
   (a) Neel temperature   (b) Curie temperature
   (c) Weiss temperature   (d) None of these

viii. The forbidden energy gap for semi-conductor material is approximately in order of **1**
(a) 1eV   (b) 3eV   (c) 5eV   (d) 7eV

ix. Which of the following property changes when voltage is applied across electro-chromic material? **1**
(a) Optical property   (b) Magnetic property
(c) Electrical property   (d) Chemical property

x. Which of following exhibit property of spontaneous polarization? **1**
(a) Piezoelectric material   (b) Ferroelectric material
(c) Super alloy   (d) Bio-material

Q.2   i. Differentiate between ionic bond and covalent bond. (any 4) **2**

ii. Molybdenum has a BCC crystal structure, an atomic radius of 0.1363 nm, and an atomic weight of 95.94 g/mol. Compute its theoretical density? N_A = Avogadro's number $6.023×10^{23}$ atoms/mol. **3**

iii. Define atomic packing factor. Derive atomic packing factor for simple cubic and face centred cubic structure. **5**

OR   iv. Explain classification of solid material? **5**

Q.3   i. Discuss Gibbs Phase Rule in brief. **3**

ii. Sketch and explain phase diagram for binary eutectic copper-nickel alloy system with eutectic reaction. **7**

OR   iii. Write short note on non-ferrous metal and alloys. Explain properties and application of brass and bronze. **7**

Q.4   i. Discuss briefly the liquid crystal polymer. **3**

ii. Explain SF_6 gas in terms of general properties, specifications, advantages, gas handling equipments and safety measures of handling it. **7**

OR   iii. What are ceramic materials? Explain ceramic materials on the basis of types and applications of ceramics. **7**

Q.5   i. Explain intrinsic and extrinsic semiconductors. **3**
ii. Explain hard and soft magnetic material in detail. **7**
OR   iii. Explain classification of magnetic material. **7**

Q.6   Attempt any two:
i. What are smart materials? Give its different types and applications. **5**
ii. Write a short note on Piezoelectricity and Ferro electric materials. **5**
iii. Explain scanning electron microscopy and transmission electron microscopy. **5**

******

EE3ES09 / EX3ES09 Engineering Materials
Marking Scheme

Q.1 i. Which of the following is primary bond? **1**
  (c) Covalent bond
  ii. The number of atoms per unit cell for face centred cubic structure **1**
  is?
  (d) 4
  iii. Harden ability of steel is assessed by **1**
   (b) Jominy end-quench test
  iv. On heating, if one solid phase splits into two solid phases, the **1**
  reaction is
  (a) Peritectoid
  v. Which of following is true for SF_6 gas? **1**
  (d) All of these
  vi. An ebonite is **1**
  (c) Natural rubber
  vii. The temperature below which certain materials are ferromagnetic **1**
  and above which they are paramagnetic is called
  (b) Curie temperature
  viii. The forbidden energy gap for semi-conductor material is **1**
  approximately in order of
  (a) 1eV
  ix. Which of the following property changes when voltage is applied **1**
  across electro-chromic material?
  (a) Optical property
  x. Which of following exhibit property of spontaneous polarization? **1**
  (b) Ferroelectric material

Q.2 i Difference between ionic bond and covalent bond (any 4) **2**
  (0.5 mark * 4 = 2 marks)
  ii Calculation of edge length - 1 mark **3**
  Compute its theoretical density –(0.5 mark *4 = 2 marks)
  iii. Atomic packing factor – 1 mark **5**
  Atomic packing factor for simple cubic – 2 marks
  Atomic packing factor face centred cubic structure – 2 marks
OR iv. Classification of solid material **5**

Q.3 i. Gibbs Phase Rule in brief **3**
  ii. Sketch of phase diagram for binary eutectic copper-nickel alloy – 2 **7**
  marks
  Explanation for binary eutectic copper-nickel alloy system - 4 marks
  Eutectic reaction equation – 1 mark
OR iii. Non-ferrous metal and alloys – 2 marks **7**
  Properties and application of brass and bronze 2.5 marks each
  (2.5 marks * 2 = 5 marks)

Q.4 i. Liquid crystal polymer **3**
  ii. SF_6 gas in terms of **7**
  General properties – 2 marks
  Specifications – 1 mark
  Advantages – 1 mark
  Gas handling equipments and safety measures of handling it – 3
  marks
OR iii. Ceramic materials – 2 marks **7**
  Explanation on the basis of types – 3 marks
  Applications - 2 marks

Q.5 i. Intrinsic and extrinsic semiconductors **3**
  ii. Hard and soft magnetic material 3.5 marks each **7**
  (3.5 Marks * 2 = 7 marks)
OR iii. Classification of magnetic material **7**

Q.6 Attempt any two:
  i. Smart materials – 1 mark **5**
  Types and applications – 2 marks each (2 marks * 2 = 4 marks)
  ii. Piezoelectricity and Ferro electric materials 2.5 marks each **5**
  (2.5 marks * 2 = 5 marks)
  iii. Scanning electron microscopy and transmission electron microscopy **5**
  2.5 marks each
  (2.5 marks * 2 = 5 marks)

*****