Total No. of printed pages = 6

CAI-405/EC&M/4th Sem/2017/N

ELECTRONIC COMPONENTS AND MATERIALS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

Answer *all* the questions.

1. Determine the correct options for the following questions : 1×10=10

   (i) The number of valence electrons in pentavalent impurity is

   (a) 5 (b) 3

   (c) 4 (d) 1

(ii) If the diameter of a wire is doubled, its current carrying capacity becomes

(a) one-fourth (b) twice

(c) half (d) four times.

(iii) Materials which lack permanent magnetic dipoles are known as

(a) paramagnetic (b) diamagnetic

(c) ferromagnetic (d) ferrimagnetic.

(iv) A parallel plate capacitor has its length, width and separation doubled. Its fringing effects are neglected, to keep the capacitance same, the dielectric constant must be

(a) halved (b) keep the same

(c) doubled (d) made four times.

(v) At room temperature, the current in intrinsic semiconductor is due to

(a) holes

(b) electrons

(c) ions

(d) both holes and electrons.

(vi) Which of the following is a donor impurity ?

(a) gold (b) Indium

(c) boron (d) Phosphorus.

(vii) Based on the fabrication technique an IC can be classified in

(a) 2 types (b) 3 types

(c) 4 types (d) 5 types.

(viii) Which of the following is an alloy ?

(a) Copper (b) Nichrome

(c) Nickel (d) Lead.

(ix) The units of μ_0 and μ_r are

(a) H/m for both

(b) H/m for μ_r and no units for μ_0

(c) H/m for μ_0 and no units for μ_r

(d) Wb/m for μ_0 and no units for μ_r.

(x) If the temperature of an extrinsic semiconductor is increased so that the intrinsic carrier concentration is doubled, then

(a) majority carrier density is doubled

(b) minority carrier density is doubled

(c) majority carrier density becomes four times the original value

(d) both majority and minority carrier density are doubled.

2. State whether the following statements are true or false : $1 \times 10 = 10$

(i) There is no hysteresis phenomenon in any dielectric material.

(ii) Diamond is a paramagnetic material.

(iii) In crystalline solids, atoms are stacked in a regular manner.

(iv) In intrinsic semiconductors, the number of free electrons is equal to the number of mobile holes.

(v) Rochelle salt is a piezo electric material.

(vi) At a very low temperature, a semiconductor becomes a conductor.

(vii) Thermistor is used in temperature measurement.

(viii) Gallium arsenide is a semiconductor.

(ix) Ganged capacitor is a variable capacitor.

(x) The resistivity decreases on alloying two materials.

3. Fill in the blanks : $1 \times 5 = 5$

(i) Constantan is an _____.

(ii) Transformer works on the principle of _____ Inductance.

(iii) Paper capacitor uses _____ as dielectric material.

(iv) The ICs having number of transistors between 100 - 1000 is known as _____.

(v) Nickel is a _____ material.

PART – B

Marks – 45

Answer *all* the questions.

4. State the intrinsic and extrinsic factors affecting conductivity of a material. 10

5. Explain the manufacturing process of carbon-film resistors. 10

6. Define the terms : dielectric constant and dielectric strength. 4

7. What are the different types of core losses in transformer ? Explain. 6

8. Write short notes on any *three* : 5×3=15

   (a) Ganged capacitor

   (b) Classification of IC

   (c) Hard and soft magnet

   (d) Ceramic materials.