Total No. of printed pages = 6

CAI-405/EC&M/4th Sem/2013/M

# ELECTRONIC COMPONENTS AND MATERIALS

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer question No.1 and any *six* from the rest.

1. (a) Fill in the blanks : 1×5=5

(i) Ceramics are harder and stiffer than ———.

(ii) Hybrid ICs are widely used for high power ——— applications.

(iii) The SI unit of inductance is ———.

(iv) Carbon is the ——— most abundant chemical element in the universe by mass.

(v) The shielding can reduce the ——— coupling of radio waves.

[Turn over

(b) Choose the correct answer : 1×5=5

(i) If one component of an IC fails

(a) the component is replaced

(b) the entire IC is replaced

(c) replacement depends on the damage

(d) None of these.

(ii) In a five-dot code used for capacitor rating, the first dot stands for

(a) the first digit

(b) tolerance

(c) the temperature characteristic

(d) the operating voltage.

(iii) The magnitude of the induced emf across an inductor is proportional to

(a) rate of change of flux

(b) rate of change of current

(c) Both (a) and (b)

(d) None of these.

(iv) Johnson noise in resistors is linked with

(a) operating temperature

(b) contact resistance

(c) operating voltage

(d) None of these.

(v) The reluctance offered by a magnetic material is highest when it is

(a) ferromagnetic

(b) paramagnetic

(c) diamagnetic

(d) ferrimagnetic.

2. (a) Write any two physical and chemical properties of Tantalum. 2+2=4

(b) Write some applications of Thorium. 3

(c) Write some uses of molybdenum as catalyst. 3

3. (a) Describe in brief the fabrication of cracked carbon resistors. 8

(b) The first two colour band of a resistor are red, the third band is green and the fourth band is blue. Find the value of the resistor. 2

4. (a) What do you mean by eddy current loss and residual loss ? Explain. 5

(b) What are the different types of magnetism ? Compare each type of magnetism on the basis of their magnetic behaviour with suitable diagram. 5

5. (a) Define RF shielding. Write some applications of RF shielding. 3

(b) What are superconductors ? Write any three uses of superconducting materials. 1+3=4

(c) Write the difference between linear and non-linear dielectrics. 3

6. (a) Define ceramics material with examples. What are the advantages of ceramics material as compared to other materials ? 5

(b) Give the classification of ICs on the basis of their applications. Also write some examples of each. 2

(c) Write short notes on VLSI. 3

7. (a) A solenoid with a length of 30 cm, a radius of 1 cm and 500 turns carries a steady current I = 2A. 6

(i) Find the magnetic flux through the solenoid, assuming the magnetic field to be uniform.

(ii) What is the self inductance of the solenoid ?

(iii) What is the induced emf in the solenoid if the rate of change of current is $\frac{dI}{dt} = 100\ A/S$ ?

(b) Define : 4

(i) Hysteresis

(ii) Residual magnetism

(iii) Dielectric strength

(iv) Loss angle.

8. (a) The net cross-sectional area of a single phase, 50 Hz transformer is 500 $cm^2$ having 400 and 100 turns in the primary and secondary winding respectively. If it is connected to a 230V, 50 Hz supply, calculate :

(i) Emf induced in the secondary

(ii) Maximum value of the flux density in the core. 2+2=4

(b) What is the difference between soft ferrite and hard ferrite ? 2

(c) Give a comparison between graphite and diamond. 4

9. (a) Differentiate between AF transformer and IF transformer. 5

(b) Describe mica capacitors. 5

10. (a) Point out some of the advantages of metal oxide resistors. 4

(b) Compare between thin film ICs and thick film ICs. 3

(c) Mention some applications of nickel. 3