Total No. of printed pages = 7

END SEMESTER / RETEST EXAMINATION-2019

Semester : 4th (Regular/Retest)

Subject Code : EI-405

ELECTRICAL ENGINEERING MATERIALS

Full Marks – 70

Time – Three hours

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

Instruction :

All questions of PART – A and PART – B are compulsory.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

(a) ——— has the highest electr ical conductivity.

(b) ——— is used as insulating material in spark plug.

(c) Germanium has ——— bond.

[Turn over

(d) The relative permeability of paramagnetic material is ————.

(e) Dielectric constant for vacuum is ————.

(f) Carbon has ———— temperature coefficient of resistance.

(g) The relative permeability of super conducting material is ————.

(h) Main alloying element of corrosion resistant steel is ————.

(i) The electrons present in the outermost orbit are called ————.

(j) The property of material by which it can be rolled into sheet is called ————.

2. Choose the correct answers : 1×5=5

(i) Electric stress is expressed in terms of

(a) Ohm/cm (b) Henry/cm

(c) Farad/cm (d) kV/cm

(ii) When a ferromagnetic substance is magnetized small changes in dimensions occur. Such a phenomenon is known as

(a) Magnetic hysteresis

(b) Magnetic expansion

(c) Magnetostriction

(d) Magneto-calorisation

(iii) Sulphur hexafluoride is used for

(a) Dynamos

(b) DC series motor

(c) Switchgear

(d) Synchronous motor

(iv) Electric breakdown strength of a material depends on its

(a) Composition (b) Moisture content

(c) Thickness (d) All of these

(v) Which of the following elements has four valance electrons ?

(a) Arsenic (b) Silicon

(c) Boron (d) Indium

3. Write true or false : 1×10=10

(i) Copper, silver and gold do not exhibit superconducting property.

(ii) Electrical resistance of semiconductor increases with the increase of temperature.

(iii) Aluminium is easily solderable.

(iv) Ferrites are generally hard and brittle.

(v) Eureka is copper nickel alloy.

(vi) Atomic number of silicon is 32 and that of germanium is 14.

(vii) Magnetic susceptibility is dimensionless.

(viii) Resistivity of insulator ranges from 10^9 to 10^{18}.

(ix) Hole current is the movement of negative charges in the opposite direction from the electron flow.

(x) For DC voltage an inductor is virtually a short circuit.

PART – B

Marks – 45

4. (a) Define conductivity and resistivity of electrical materials. 2

(b) What are the effects of temperature on resistance of metal, alloy and semiconductor ? 2

(c) State the advantages of copper as compared to aluminium as a conductor of electricity. 3

(d) A coil of relay is made of copper wire. At a temperature of 20°C, the resistance of the coil is 400Ω. Calculate the resistance of the coil at temperature of 80°C. The temperature coefficient of resistance of copper is 0.0038 Ω/ Ω/°C at 0°C. 3

5. (a) Classify the following as conductor or semiconductor 2

(i) Gold (ii) Germanium

(iii) Silver (iv) Silicon

(b) Define intrinsic and extrinsic semiconductor. 2

(c) Why does a pure semiconductor behave like an insulator at absolute zero temperature ? 3

(d) What are the advantages of semiconductor materials used in electrical industry ? 3

6. (a) Describe the characteristics of ideal insulating materials. 3

(b) Write briefly on the factors affecting the insulation resistance. 3

(c) Write short notes on any *one* :

(i) Impregnation

(ii) Hygroscopicity. 2

7. (a) Define the term 'dielectric strength' of an insulating material. 1

(b) What are the factors which affect the dielectric strength of an insulating material ? 2

8. What is soldering ? Describe briefly various methods of soldering. 3

9. Describe about the concept of non-destructive testing and methods adopted for testing different materials. 3

10. (a) Define the terms 'Permeability' and 'Curie point'. 2

(b) What is meant by hysteresis loop ? Draw the hysteresis loop for ferromagnetic materials. 3

(c) Describe the application of electromagnets. 3