

Total No. of Questions : 8]

SEAT No. :

PD-4053

[Total No. of Pages : 3

[6402]-12

S.E. (Electrical)

Material Science

(2019 course) (Semester - III) (203142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume Suitable data if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Classify solid insulating materials according to the temperature ranges. Hence write properties and applications of any two materials from Class A type. [6]

b) State the properties and applications of - [6]

- i) Air
- ii) Transformer oil

c) Explain properties of insulating materials which are used in Cables and Transformers. [5]

OR

Q2) a) Classify insulating materials and hence write properties and applications of any two materials from Class F type. [6]

b) Explain properties of insulating materials which are used in Capacitor and Rotating Machines. [5]

c) State the properties and applications of [6]

- i) Sulphur Hexa Fluoride
- ii) Askarel

P.T.O.

Q3) a) Define with units— [6]

- i) Magnetic dipole moment ii) Magnetization
- iii) Magnetic susceptibility

b) With necessary diagram, classify magnetic materials on the basis of magnetic dipole moment and magnetic susceptibility. [6]

c) What is Curie temperature? Explain Ferro-magnetic behaviour below Critical temperature. [6]

OR

Q4) a) Draw and explain magnetization curve for a ferromagnetic material and hence define with units - [6]

- i) Coercive force ii) Saturation.

b) In a magnetic material, hysteresis loss is 150W when maximum flux density of 1.3 tesla and frequency is 50Hz. What would be hysteresis loss if flux density is decreased to 0.8 tesla and frequency is increased to 60 Hz? Assume that hysteresis loss is proportional to $(B_m)^{1.7}$. [6]

c) Differentiate Soft Magnetic Materials and Hard Magnetic Materials. [6]

Q5) a) With the neat diagram, explain principle of working of thermocouple. Give its examples along with the temperature ranges. [6]

b) A filament of a 230V lamp is to be drawn from a wire of having a diameter of 0.025mm and resistivity at 28°C is $5.65 \times 10^{-6} \Omega\text{-cm}$. If the resistance temperature coefficient at 28°C is $5 \times 10^{-3} / ^\circ\text{C}$. Calculate the length of the filament to dissipate 40W at filament temperature of at 3003°C. [6]

c) State and write properties of electrical carbon materials and materials used for Lamp Filaments. [5]

OR

- Q6)** a) With the neat diagram, explain principle of working of thermal bimetal. Give its examples and applications. [6]
- b) State and write properties of materials used for solders and materials used for different types of fuses. [5]
- c) Describe properties and applications of Constantan and Brass. [6]
- Q7)** a) Explain with neat diagram - Single Electron Transistor (SET). [6]
- b) Describe with neat diagrams - Boron Nano Tubes [6]
- c) Explain Nano materials used in Batteries and Photovoltaic Cells [6]

OR

- Q8)** a) Describe with neat diagram - Nano wires [6]
- b) Describe with neat diagrams - Carbon clusters [6]
- c) Write a short note on - C_{60} [6]

