

B.E. ELECTRICAL ENGINEERING SECOND YEAR FIRST SEMESTER – 2023

ELECTRICAL ENGINEERING MATERIALS

Time : 3 Hours

Full Marks : 100

(50 marks for each Part)

Part - I (50 Marks)

Use Separate Answer scripts for each part.

Answer any three (03) questions.

All questions are of eight (08) marks. Two (02) marks reserved for neat and well organized answers.

1. (a) Derive Curie-Weiss law for ferromagnetic materials. Explain the domain theory from Weiss hypothesis.
(b) From the domain theory of ferromagnetic materials discuss the hysteresis characteristics.
2. (a) From Drude Model of conductivity derive ohm's law. From the same model explain why resistivity depends on temperature.
(b) What is Neel' temperature. Explain the temperature dependence of susceptibility for anti-ferromagnetic material.
3. (a) Classify magnetic materials based on the relative presence of permanent magnetic dipole moments.
(b) Discuss the important properties of a contact material for being suitable as Electrical contact.
4. (a) What is magnetostriction? How this effect dictates power loss in magnetic materials?
(b) Write short note on Ferrites
5. (a) Explain Slisbee's rule of Superconducting materials and its implication.
(b) Discuss the classification of Superconducting materials based on Meissner's effect.

[Turn over

B.E. ELECTRICAL ENGINEERING SECOND YEAR FIRST SEMESTER - 2023**SUBJECT: ELECTRICAL ENGINEERING MATERIALS**

Time: Three Hours

Full Marks: 50

Use a separate Answer-Script for each part

Two marks for neat and well-organized answers

Question No.	Part-II	Marks
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Answer any three questions

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| 1. | (a) Explain Bohr's theory of Hydrogen Atom. Hence derive the expression of total energy of electron in Bohr's Hydrogen atom. | 5+5 |
| | (b) Discuss about the sigma and pi bonding of atoms. | 6 |
| 2. | (a) Explain insulators, semiconductors and conductors according to the energy band theory of solids. | 9 |
| | (b) Discuss briefly about the thermal classification of insulating materials. | 7 |
| 3. | (a) The insulation resistance of a 100m long cable is 10 MΩ at 27°C. At 60°C the insulation resistance value decreases to 1% of that at 27°C. Find the insulation resistance at 40°C for a length of 50m of the same cable. | 7 |
| | (b) If sodium chloride crystal is subjected to an electric field of 1400 V/m and the resulting polarization is $4.2 \times 10^{-8} \text{ C/m}^2$, calculate the relative permittivity of sodium chloride. Derive the formula you have used. | 2+7 |
| 4. | (a) Explain the mechanism of breakdown in gaseous dielectrics. Discuss about the effect of pressure on the dielectric strength of gaseous dielectrics. | 6+2 |
| | (b) Discuss about the properties of transformer oil. What are its major impurities? Discuss about the process by which such impurities could be removed from transformer oil. | 4+2+2 |
| 5. | Write short notes on any two of the following: | 2×8 |
| | (i) Dielectric Dissipation Factor | |
| | (ii) Cross-linked polyethylene (XLPE) | |
| | (iii) Polyvinyl Chloride (PVC) | |
| | (iv) Different kinds of Dielectric Polarization | |