

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024

(1st Year, 2nd Semester)

ELECTRICAL ENGINEERING MATERIALS

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-I

Answer any three questions

(Two marks are reserved for neatness and well organized answers)

- 1.a) Briefly compare the following properties of low resistivity and high resistivity conductor materials.
Temperature coefficient; Mechanical strength; Melting point; Ductility. 8
- b) Write properties and uses of one low resistivity and one high resistivity conductor material. 8
2. a) Explain the hysteresis curve using diagrams of soft and hard magnetic materials. 8
- b) Discuss the domain theory of ferromagnetic materials with a suitable diagram. Define magnetostriction. 8
3. a) Describe the characteristics of paramagnetic materials. Define Curie temperature and Neel temperature associated with magnetic materials. 10
- b) Briefly explain the properties of ferrimagnetic materials or ferrites. 6
4. a) Give the relation between the B, H and M. Also derive the relation between magnetic susceptibility and magnetic permeability. 10
- b) Describe electron-spin, electron-orbital magnetic moment. 6

[Turn over

5. Write short notes on any two of the following:

2×8

- a) Superconducting materials and its applications.
- b) Assumptions of Classical free-electron (Drude-Lorentz) theory.
- c) Different types of energy involved in domain growth
- d) Alnico and CRGO

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**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR
SECOND SEMESTER - 2024**

SUBJECT: ELECTRICAL ENGINEERING MATERIALS

Time: Three Hours

Full Marks: 100
(50 Marks for each part)

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 for the total energy of the electron in Bohr's Hydrogen atom. | 4+6 |
| | (b) | Discuss about the sigma and pi bonding of atoms. | 6 |
| 2. | (a) | With suitable examples, classify insulating materials in the light of thermal gradation. | 7 |
| | (b) | Explain insulators, semiconductors and conductors according to the energy band theory of solids. | 6 |
| | (c) | Discuss about the differences between ionic bonding and metallic bonding. | 3 |
| 3. | (a) | A customer brings 25m of a cable from a roll of 100m in the shop. It was specified that the insulation resistance of the roll of cable was $350M\Omega$ at $25^{\circ}C$. The insulating material of the cable is such that an increase in $10^{\circ}C$ is required for reducing the insulation resistance to half the value at $25^{\circ}C$. What will be the insulation resistance of the 25m piece if the customer measures it at $45^{\circ}C$? | 7 |
| | (b) | What do you understand by relative permittivity of an insulating material? Discuss how it is related to the polarizability of an insulating material. | 2+7 |

4. (a) 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. Name a substitute of transformer oil and explain why such substitutes are not very popular in use. 4+2+2+2
- (b) Discuss in brief how pressure affect the breakdown voltage of gas insulation. 6
5. Write short notes on any two of the following: 2×8
- (i) Bonding and antibonding
 - (ii) Nuclear Binding Energy and Mass Defect
 - (iii) Teflon
 - (iv) Cross-linked polyethylene (XLPE).