

MASTER OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION,
(1st Year, 2nd Semester)

CONDITION MONITORING OF HIGH VOLTAGE EQUIPMENT

Time: Three Hours

Full Marks: 100

Answer *any six* questions

Four Marks are reserved for neat and well organized answers

1. a) Write short notes on (i) surface resistivity and (ii) dielectric dissipation factor related to properties of insulating materials. 8
- b) Give an expression how insulation resistance of a material varies with temperature. The insulation resistance of a 100m long cable is 25 MΩ at 20°C. At 40°C the insulation resistance value decreases by 1% of that at 20°C. Find the insulation resistance at 30°C for a length of 200m of the same cable. 8

2. What do you understand by the term "Good Insulation"? With a schematic, show how the insulation resistance can be measured. With the help of proper axes, draw the curves showing components of current measured during DC testing of insulation. How does humidity affect the insulation resistance? 16

3. a) Explain (i) electronic polarization, (ii) ionic polarization, (iii) dipolar polarization and (iv) interfacial polarization. 10
- b) Derive a relationship to show power loss per unit volume of the dielectric depends on frequency, field intensity, and loss tangent. 6

4. a) Identify a method whereby an analysis can be performed from the dissolved gases in the case of oil-filled transformer. 8
- b) Write a note on "Duval's Triangle" highlighting some typical fault classification. 8

5. Explain the basic concept behind polarization and depolarization current measurement in oil-paper insulation. Describe with the help of a schematic how polarization and depolarization current (PDC) measurement can be performed on transformers. 16

6. Why cannot the condition of MOV surge arresters be predicted by simply measuring the total leakage current? Describe the methodology of condition monitoring of MOV surge arresters. Explain how surge counters operate in metal oxide surge arresters. 16
7. a) How fibre optic sensors can be used as condition monitoring? 5
b) Give some examples of fibre optic sensors used for condition monitoring. 6
c) Mention some uses of optical fibres with respect to monitored equipments. 5
8. a) Why condition monitoring of electrical equipment is necessary? 4
b) State how asset reliability and productivity can be improved by condition monitoring. 8
c) Mention how better economic performance can be achieved through proper condition monitoring. 4