

**MASTER OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION, 2017**

(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) Why is condition monitoring of electrical equipment 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
  
2. Briefly explain how (i) volume resistivity and (ii) surface resistivity can be measured in an insulating material. Give suitable illustrations of the experimental setup. 16
  
3. Why is dissolved gas analysis performed as a preventive maintenance in the case of oil-filled transformer? Discuss the method in brief. Why is degree of polymerization test performed in transformer oil? Discuss how this analysis is carried out. 16
  
4. a) What do you understand by the term thermal endurance? How electrical parameters are correlated with change in temperature of insulating materials? 3
- b) How insulation resistance changes with temperature? Justify with suitable expression. Mention some characteristic of liquid insulation materials with respect to thermal endurance. 5
- c) Give an expression of variation of insulation resistance with temperature. The insulation resistance of a 100m long cable is 20 MΩ at 25°C. At 45°C the insulation resistance value decreases to 1% of that at 25°C. Find the insulation resistance at 35°C for a length of 50m of the same cable. 8
  
5. a) How different types of polarization are influenced by alternating field? Explain with illustrations. 8

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- b) Derive an expression for power loss per unit volume of the dielectric due to alternating field. On what factors does it depend? 8
6. a) How fibre optic sensors can be used in 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
7. a) Write a note on condition monitoring of MOV Surge Arresters. Explain how surge counters operate in metal oxide surge arresters. 10  
b) Mention how tube-type of surge arrester operates. What can be the possible limitations of these units? 6
8. a) Describe with the help of a schematic how polarization and depolarization current (PDC) measurement can be performed on transformers. 8  
b) With the help of basic expression, explain the method of analysis in time domain dielectric spectroscopy. Show with a rough sketch how the time domain curves vary with different ageing conditions in oil-paper insulation. 8

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