M.E. ELECTRICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2024

SUBJECT: DIELECTRIC ENGINEERING (HV)

Time: Three Hours   Full Marks: 100

Question No.		Marks

Answer any four questions

1. (a) Discuss about the five significant electrical properties of insulating material used in HV equipment.   **10**

   (b) The insulation resistance of 200m length of a cable is 250MΩ at 45°C. The dielectric is such that an increase of 10°C is required for reducing its insulation resistance to half the value at 45°C. Find the insulation resistance of 50m of the cable at 35°C.   **7**

   (c) Discuss about the process of impregnation of fibrous insulation for use in electric equipment.   **8**

2. (a) Describe current growth phenomenon in a gas using Townsend's first and second ionization coefficient. How is the condition of breakdown obtained in Townsend discharge?   **13+2**

   (b) In an experiment in a certain gas it was found that the steady state current is 5 x 10-6 A at 12 kV at a distance of 0.6 cm between the plane electrodes. Keeping the field constant and reduces the distance to 0.15 cm results in a current 4.5 x 10-7 A. Calculate Townsend's primary ionization coefficient α.   **5**

   (c) State and explain Paschen's law   **5**

3. (a) What are commercial liquid dielectrics?   **4**

   (b) Explain the various theories that explain breakdown in commercial liquid dielectrics.   **15**

   (c) Briefly explain the breakdown procedure of pure liquid dielectrics   **6**

4. (a) Briefly explain the various mechanisms of ionization in a gaseous dielectric? 12

 (b) What are the electronegative gases? Mention the important characteristics of electronegative gases. 5

 (c) Briefly explain the various factors that influence the breakdown of electronegative gases. 8

5. (a) Why thermal breakdown is practically more significant than other breakdown mechanisms? 5

 (b) Discuss the partial discharge phenomenon with the help of the capacitive schematic circuit. 10

 (c) Explain the phenomenon 'treeing' and 'tracking' associated with breakdown of the solids. 10

6. Write short notes on any two of the following: 2×12.5

 i. Crystal structure of solids
 ii. Dielectric polarization
 iii. Bonding mechanisms of atoms