MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, GOVERNMENT OF MIZORAM, JULY, 2022.

ENGINEERING PAPER – II

ELECTRICAL ENGINEERS

Time Allowed : 3 hours FM : 100 PM : 40

Marks for each question is indicated against it.

Attempt all questions.

PART – A (50 MARKS)

1. (a) Define Conductor and Insulator with two examples. **(2)**

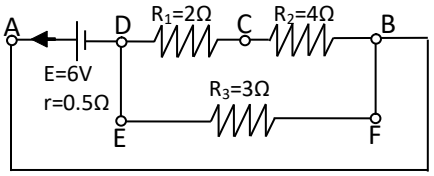
(b) Name any five materials used for Cable Insulation. **(3)**

(c) Define Solenoid and Electromagnet and state any four applications of Electromagnet. **(3)**

(d) Write down the properties of good insulating material. **(2)**

2. (a) State and explain Kirchhoff's First Law and Second Law with circuit Diagram. **(4)**

(b) Find the current through each resistance in the circuit shown below. Also find the potential difference across the terminals of the battery and each of the three resistances. **(4)**



(c) Define Electric Circuit and Electrical Network. **(2)**

3. (a) Write down different effects for electrical measuring instrument with example. **(4)**

(b) Define the following-

(i) Megger and what is the usual Unit of its measurement. **(2)**

(ii) Eddy Current and how to reduce Eddy Current Loss. **(2)**

(c) What is the SI Unit of- **(2)**

(i) Inductance (ii) Capacitance

(iii) Resistance (iv) Magnetic Flux

4. (a) Define the following- **(4)**

(i) Earthing/Grounding (ii) System Earthing

(iii) Equipment Earthing (iv) Station Earthing

(b) Write down any two methods for measuring Earth Resistance with detail diagram. **(2)**

5. (a) Define Power Factor with diagram. **(2)**

(b) Write a note on effects of low power factor in- **(3)**

(i) Transmission line (ii) Switchgear and Busbars.

(c) State and explain any two methods for improving Power Factor. **(2)**

6. (a) State the difference between a Primary Cell and Secondary Cell with example. **(3)**

(b) When a resistance of 2V is placed across the terminals of a battery, the current is 2.0 A. When the resistance across the terminal is increased to 5V the current falls to 1.0 A. Find the emf of the battery and its internal resistance. **(4)**

PART-B (50 MARKS)

7. (a) Explain the working principle of an Induction Motor. **(2)**

(b) Calculate the synchronous speed of a 2-pole machine and 4-pole machine. **(2)**

(c) Define per unit Slip of an Induction Machine. What will happened if the load on the motor is increased? **(3)**

8. (a) Define the working principle of Transformer and derive the transformation equation. **(3)**

(b) Write down different parts of power Transformer. **(2)**

(c) Write a note on the following- **(3)**

(i) Power transformer (ii) Potential Transformer

(iii) Current Transformer

(d) Earth resistance of power transformer need to be below 1V. However, the actual Earth resistance of the earthing is 5V. Explain how to achieve earth resistance below or equal to 1V. **(2)**

(e) State and explain the various category of Test on a 3 Phase Induction Motor. **(2)**

9. (a) What is Circuit Breaker (CB)? Write down the different type of CB. **(2)**

(b) Define Isolator and Corona loss. **(2)**

(c) Write down different transmission rated voltage. **(1)**

(d) Derive the equation of per phase power loss in Transmission line. **(2)**

(e) A 3f, 11kV transmission line is 10Km long and delivered 200kW at 0.8 lagging power factor. The resistance of the line is 0.9 V/Km per Phase. Calculate the percentage power loss in the line assuming 11kV at the receiving end. **(3)**

10. What is Zener Diode? Explain how Zener diode acts as a voltage regulator with suitable diagram. **(3)**

11. (a) A 3-Phase Induction Motor revolving on a reverse direction. Describe what checks to be done and how to correct rotation. **(2)**

(b) State necessary checks to be done before operating the following Water Pumping machineries. **(6)**

(i) Diesel Engine (ii) Electric Motor

(iii) Water Pump

(c) Discuss how to measure PI Value of a power transformer. **(2)**

12. Explain the working principle of the following. **(4)**

(a) DOL Starter (b) Star-Delta Starter

(c) Soft Starter

13. (a) Write a note on Solar Radiation and Solar Irradiation. **(2)**

(b) What is Solar Photo Voltaic Cell? Write down different types of Solar Module. **(2)**

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