MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR
AE/SDO (ELECTRICAL)
UNDER POWER & ELECTRICITY DEPARTMENT, NOVEMBER 2016

ENGINEERING PAPER – I

Time Allowed : 3 hours   FM : 100   PM : 40

Marks for each question is indicated against it.

Answer __Question No.1__ and any other __nine (9)__.

(Candidates are expected to answer the question from their personal experiences as far as possible.)

1. Choose the most correct answer: **(10×1=10)**

(a) If the temperature increases, the breakdown voltage value of transformer oil

   (i) Increases   (ii) Decreases

   (iii) Remains the same   (iv) do not depends on temperature.

(b) Open circuit test of a transformer is used to determine

   (i) Core loss at full load   (ii) Core loss at no load

   (iii) Copper losses at no load   (iv) Copper loss at full load

(c) Vector group of distribution transformer normally used in Mizoram are

   (i) Dy11   (ii) Dy0

   (iii) Yy11   (iv) Yy0

(d) The working principle of Transformer differential relay depends on-

   (i) Ohms Law   (ii) Mesh Law

   (iii) Kirchhoff's Voltage Law   (iv) Kirchhoff's Current Law.

(e) Increase in the speed of a rotor of an AC generator increases

   (i) Voltage   (ii) Current

   (iii) Frequency   (iv) Power

(f) As seen from nameplate of CT indicated below, which one is metering core?

Class	Core-I : 0.5	Core-II : 5P10	Core-III:PS	Core-IV:PS

   (i) Core-I   (ii) Core-II

   (iii) Core-III   (iv) Core-IV

(g) Turbine used at Serlui B SHP is

   (i) Vertical Pelton turbine   (ii) Vertical Kaplan turbine

   (iii) Horizontal Francis turbine   (iv) Horizontal Gorlov Helical turbine

(h) Earth resistance of domestic earth electrode must not be greater than

   (i) 1 Ohm   (ii) 2 Ohm

   (iii) 5 Ohm   (iv) 10 Ohm

(i) VRLA batteries are common nowadays. The full form of VRLA is-

    (i) Valve-regulated lead-acid   (ii) Voltage-regulated lead acid

    (iii) Variable resistance lead acid   (iv) Valve resistance lead acid

(j) Metallic reed is associated with measurement of

    (i) Power   (ii) Resistance

    (iii) Frequency   (iv) Voltage

2.   (a) Explain 'slip' of an induction motor.   **(2)**

    (b) An 8 pole alternator runs at a speed of 750 rpm. It supplied power to a 6-pole, 3-phase induction motor, which has a full load slip of 3%. Find the full load speed of the induction motor and the frequency of rotor emf.   **(8)**

3. A single phase induction motor does not have starting torque. Explain how a single phase induction motor can be made to have its own starting torque.   **(10)**

4. Write detail important commissioning tests to be conducted for successful commissioning of 2.5MVA, 33/11kV power transformer, mentioning measuring instrument used with appropriate ratings of the instruments.   **(10)**

5.   (a) What do you mean by Corona?   **(2)**

    (b) Explain how you will notice the existence of corona in a transmission line.   **(2)**

    (c) What are the factors effecting Corona losses?   **(4)**

    (d) How will you improve corona losses?   **(4)**

6.   (a) What is Buchholz relay?   **(2)**

    (b) Describe the working principle of Buchholz relay.   **(4)**

    (c) State uses and functions of breather in a transformer?   **(2)**

    (d) What is PRV and mention its use.   **(2)**

7.   (a) What are the factors causing T&D loss in transmission & distribution line? What are the important actions to be taken to reduce/minimize T&D loss in power system?   **(4)**

    (b) During the month of October, 2015 suppose the energy consumed in one 11kV feeder is 20MU where as the total consumption of all consumers in that 11kV feeder is 16MU, which is the total billed unit. What will be the billing efficiency and what is the percentage T&D loss in that feeder?   **(3+3=6)**

8.   (a) Why is trivector meter so called?   **(2)**

    (b) You are using 3-phase, 4-wire electronic energy meter designed for CT Ratio of 50/5A. But the actual CT Ratio of the feeder is 100/5A. Find out the Multiplying Factor to be used for taking the reading of the energy meter.   **(2)**

    (c) A domestic consumer having connected load of 2kW is using MDI meter, the meter reading is as follows:-

    Previous reading = 1234kWh and Present reading = 1436 kWh

    Calculate the energy charge of his consumption as per existing rate of tariff in Mizoram, i.e.,

      (i) Fixed charge is Rs 35/- per month per kW of contracted load

      (ii) First 50 kWh @ Rs 2.35 per kWh

      (ii) Next 50 kWh @ Rs 3.25 per kWh

      (iii) Next 100 kWh @ 4.20 per kWh

      (iv) Above 200kWh @ 4.80 per kWh

    What will be the amount of rebate he can avail as per existing tariff in force?   **(6)**

9. List out an air insulated 132/33kV sub-station switchyard equipments with required quantities having main and transfer bus with transformation capacity of 1×12.5MVA. Illustrate arrangement of equipments with single line diagram. **(7+3=10)**

10. Describe all necessary step-by-step procedure for successful commissioning (charging and discharging) of lead acid storage battery used in a Sub-station, mentioning total 'Ah' capacity and voltage. **(10)**

11. Answer in short: **(5×2=10)**
    (a) At how many points are the transformers to be earthed? Name them.
    (b) What are Ferranti effect and skin effect in AC transmission line?
    (c) Explain Load Factor and Demand Factor.
    (d) Why are transformers rated in kVA?
    (e) Explain Voltage regulation of transmission line.

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