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10EE62

Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Switchgear and Protection

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Explain the following characteristics of fuse (i) cut – off ii) Time - current. **(10 Marks)**

b. What are isolating switch, load breaking switch and Earthing switch? **(05 Marks)**

c. With the neat diagram, explain the construction and working of liquid fuse. **(05 Marks)**

2 a. Explain clearly the problem involved in interruption of low inductive currents. What will happen when interruption of capacitive current take place? **(07 Marks)**

b. What is resistance switching? Derive an expression for critical resistance by analyzing the resistance switching in the circuit breaker. Also write the equation for frequency of damped oscillation. **(10 Marks)**

c. A 3 phase OCB is rated at 1000A, 1500MVA, 33KV, 4S. Find the rated normal current, symmetrical breaking current, making current, short time current rating. **(03 Marks)**

3 a. With a neat sketch, describe the working principle of an axial air blast type circuit breaker. **(05 Marks)**

b. Enumerate the properties of SF_6 gas which render its use in high voltage circuit breakers. **(07 Marks)**

c. With the neat diagram, describe the working principle of vaccum circuit breaker. For what range is it recommended? **(08 Marks)**

4 a. Write short notes on i) Unit testing ii) Synthetic testing. **(10 Marks)**

b. What are the causes of overvoltages arising on a power system? Why is it necessary to protect the lines and other equipments of the power system against overvoltage? **(05 Marks)**

c. Explain Expulsion type lighting arrestor. **(05 Marks)**

PART - B

5 a. Discuss in brief the various essential qualities of protective relaying. **(12 Marks)**

b. Explain what is meant by primary and back – up protection. Mention the various methods used to provide back – up protection. **(08 Marks)**

6 a. Explain with the neat sketch, the directional induction type over current relay. **(12 Marks)**

b. Explain the principal of distance relay. Draw the operating characteristic of impedance relay, Mho relay and reactance relay. Write the characteristics equation. **(08 Marks)**

7 a. Write short notes on : **(10 Marks)**
i) 100% stator earth fault protection ii) Loss of field protection in an alternator.

b. An alternator stator winding is protected by a percentage differential relay as shown in fig. Q7(b). The relay has a 0.15amp minimum pick up and a 12% slope. A high resistance ground fault has occurred near the grounded neutral end of the generator winding when the generator is carrying the load current as shown in the fig. Q7(b(i)). The current flowing at each end of the generator winding is as shown in the fig. Q7(b(ii)). Assuming that the CT's have a 400/5 ampere ratio and no inaccuracies, will the relay trip the generator CB under this fault condition. **(05 Marks)**

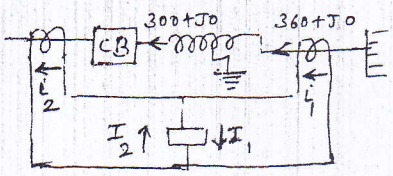

Fig.Q7(b(i))

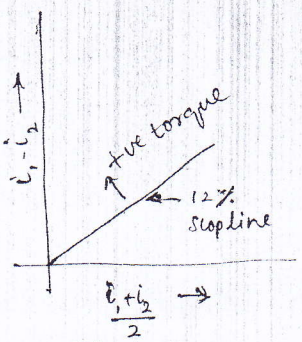

Fig.Q7(b(ii))

c. List any two abnormal conditions and its effect that is observed in the generator. How is it protected against those abnormal conditions? **(05 Marks)**

8 a. What are the problems encountered in differential protection applied to transformer? **(08 Marks)**

b. Describe with the help of a neat diagram, the connection of differential protection of a transformer. A 3 – phase 33/6.6KV star / delta connected transformer is protected by differential system. The CT's on the LT side have a ratio of 300/5. Find out the C.T ratio on HT side. Indicate the same on the diagram. **(12 Marks)**

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