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B.Tech. VIII Semester (Main/Back) Examination, April/May - 2017
Electrical and Electronics Engineering
8EX3A Protection of Power System
Common with 8EE3A

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitable be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. Scientific Calculator

Unit-I

1. a) What do you understand by zone of protection? What are different characteristics of a relay? **(4+4=8)**

   b) A potential transformer ratio 100/10 volt has the following constants : primary resistance = 94.5Ω, secondary resistance = 0.86Ω, primary reactance = 66Ω, total equivalent reactance = 100Ω, No load current = 0.02 at 0.4 power factor. Calculate : **(8)**

   i) Phase angle error at no load,

   ii) Burden in VA at unit power factor at which the phase angle will be zero.

(OR)

1. a) Explain trip circuit of circuit breaker. What are the different types of circuit breaker used for protection of power system. **(4+4=8)**

   b) A 200/5A, 50Hz current transformer has a secondary comparising a non-inductive impedance of 1.6Ω. The primary winding has one turn. Calculate the flux in the core and ratio error of full load. Neglecting leakage reactance and assume the iron loss in the core to be 3.5w at full load. The magnetizing mmf. is 100AT. **(8)**

Unit-II

2. a) What do you mean by over current relay? Also explain the different types of over current relay. **(8)**

   b) How the different directional over current relay connection are obtained? Neatly draw & explain the diagram for 30°, 60° and 90° connections. **(8)**

(OR)

2. a) Explain construction, working and characteristics of HRC fuse. Also write an application advantages and disadvantages of HRC fuse. **(8)**

   b) Explain earth fault relay. Explain time setting, plug setting and current setting of over current relay. **(8)**

Unit-III

3. a) A Generator is provided with restricted earth fault protection. The rating are 11kV, 5000 kVA. The percentage of winding protected against phase to ground fault is 80%. The relay setting such that it trip for 25% out of balance. Calculate the resistance to be added in neutral to ground connection. **(8)**

   b) What is differential protection? What is percentage differential protection? Why it is superior to simple differential protection. **(8)**

(OR)

3. a) The neutral point of a 10000V alternator is earthed through a resistance of 10Ω, the relay is set to operate when there is an out of balance current of 1A. The CT's have a ratio of 1000/5. What percentage of the winding is protected against fault to earth and what must be minimum value of earthing resistance to give 90% protection to each phase winding? **(8)**

   b) Why restricted earth fault protection is provided to alternators through it leaves a portion of winding unprotected against earth fault. Can it be justified. **(8)**

Unit-IV

4. a) A 3 phase 200kVA, 10000/500V transformer is connected in delta-star. The CT's on low voltage side have turn ratio of 500/s. Determine the CT ratio on high voltage side. Also obtain the insulating current when the fault of 700A of following types occur on the low voltage side :

   i) Earth fault within the protective zone

   ii) Earth fault outside the protective zone. Assume balanced voltage.

   (10)

   b) Draw and explain the construction and working of gas actuated relay. **(6)**

4. a) What are the problem associated with transformer protection due to magnetizing inrush current? Describe the percentage biased differential relay protection scheme with harmonic restraints for transformer. **(8)**

b) What is the frame leakage protection of busbars? Discuss its principle and field of applications. **(8)**

Unit-V

5. a) What are the different types of protection of transmission line? Explain three step distance time characteristics. **(10)**

b) Explain protection against single phasing failure in induction motor. **(6)**

(OR)

5. a) Explain the principle of operation of distance relay. Discuss the working, torque equation, operating characteristics of the following distance relay : impedance relay, Mho relay and reactance relay. **(10)**

b) Write a short note on : **(6)**

i) Earth fault protection

ii) Negative sequence relay