DU – 099

VI Semester B.E. (E & E) Degree Examination, December 2017/January 2018
(2K11 Scheme)
EE-604 – SWITCH GEAR AND PROTECTION

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **any five** questions selecting **two** from **each** Part.*

PART – A

1. a) Draw and explain key diagram of typical 33 KV / 11 KV substation. **8**
   b) Explain different types of switches used in power system. **7**
   c) Comparison between the rewirable fuse and MCB. **5**

2. a) With a neat diagram, explain construction and operation of a HRC cartridge fuse. Mention its application. **8**
   b) Derive an expression for rate of rise of restriking voltage. **6**
   c) Explain "high resistance" method of extinguishing the Arc. **6**

3. a) Explain resistance method of switching. **6**
   b) A 50 cycles, 3ϕ alternator with grounded Neutral has inductance of 1.6 mH per phase and is connected to bus bar through a circuit breaker. The capacitance to earth between the alternator and circuit breaker is 0.003 μF per phase. The circuit breaker opens when rms value of current is 7500 A. Determine the following :
      a) Max. rate of rise of restriking voltage.
      b) Time for max. rate of rise of restriking voltage
      c) Frequency of oscillations **7**
   c) Explain working of plain break oil circuit breaker. **7**

4. a) Explain the principal operation of SF_6 circuit breaker. What are its advantages and other types of circuit breaker ? For what voltage range is it recommended ? **8**
   b) Write a note on testing of circuit breaker. **6**
   c) Explain the following : **6**
      1) Breaking capacity
      2) Making capacity
      3) Short time capacity

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PART – B

5. a) Explain in detail, the basic requirement of protective relaying. **6**

   b) Explain with the help of neat sketch, the construction and working of directional induction type and current relay. **8**

   c) For a particular transmission line, relays are used as shown in Fig. 1 **6**

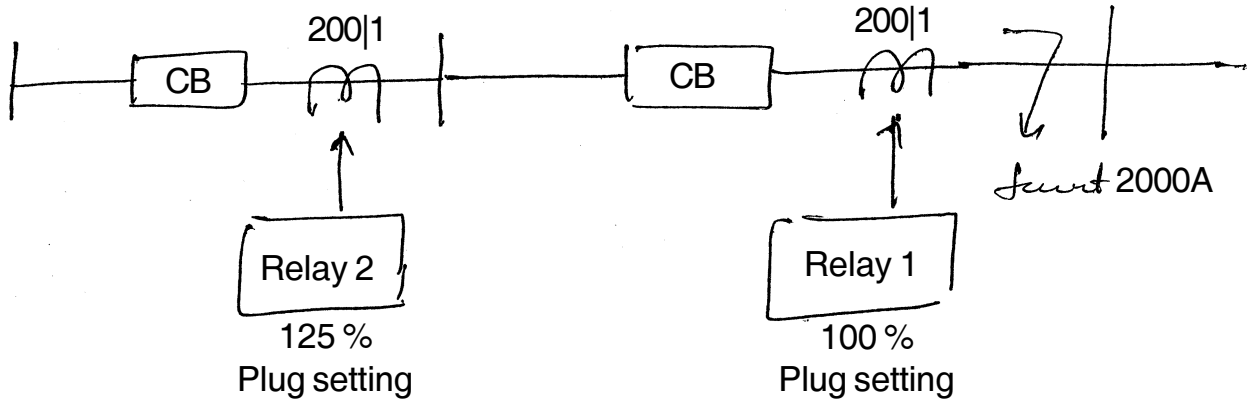

Fig. 1

For discrimination, time grading margin is 0.5 sec. Determine the time of operation of two relays. Assuming that both the relays have change as shown in Fig. 2. The Relay 1 has time setting multiplier of 0.2. Find the time setting multiplier of relay 2.

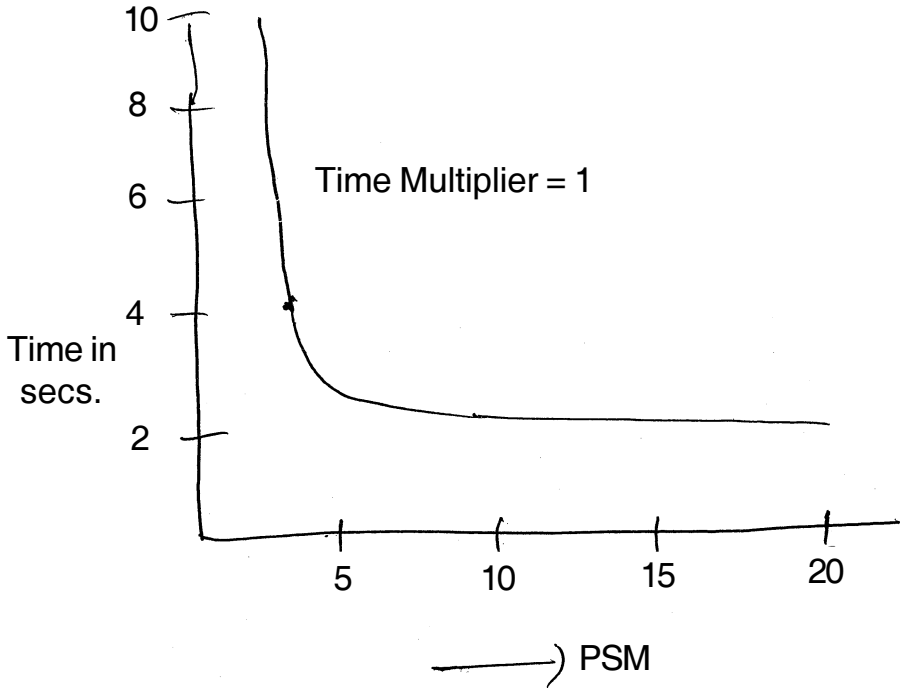

Fig. 2

6. a) Explain three stepped distance protection of transmission line. **6**

   b) Explain with a neat diagram restricted earth fault protection of generator. **6**

   c) The neutral point of a 11 KV alternator is earthed through a resistance of 12 Ω. The relay is set to operate when there is out of balance current of 0.8 A. The CT's have ratio of 2000/5. What percentage of winding is protected against earth faults ? What must be the minimum value of earthing resistance required to give 90 % of protection to each phase ? **8**

7. a) Explain with the help of vector diagram working of negative sequence relay. **8**

   b) Explain with a neat sketch protection scheme for ring main system. **6**

   c) Explain Merz-Price protection for $Y - \Delta$ transformer. **6**

8. a) With the help of a neat block diagram explain the operation of static over current relay. **8**

   b) Explain working of microprocessor based over current relay. **6**

   c) Discuss different types of static amplitude comparators. **6**
