EJ – 1199

VI Semester B.E. (Electrical & Electronics) Degree Examination, June/July 2015 (2K11 Scheme) EE – 604 : SWITCH GEAR & PROTECTION

Time : 3 Hours Max. Marks : 100

Instruction : *Answer **any five** complete questions choosing atleast **2** questions from **each** Part.*

PART – A

1. a) Write schematic single line diagram of power systems compounds. **6**
   b) Write short note on isolators and load break switches. **6**
   c) Describe the construction and operation of the HRC catridge fuse. What are the applications of HRC fuses ? **8**
2. a) Obtain an expression for rate of rise of restriking voltage. **8**
   b) Explain the phenomenon of arc and how is it maintained in the circuit breaker. **6**
   c) Explain the arc interruption theories of ac circuit breaker. **6**
3. a) By analyzing the resistance switching of circuit breaker, derive an expression for critical resistance. Why resistance switching is necessary in ABCB ? **10**
   b) In a 132 KV system, the inductance and capacitance upto the location of circuit breaker are 0.4 H and 0.015 μ f respectively. Determine the
      i) Maximum value of the restriking voltage across the contacts of the circuit breaker.
      ii) Frequency of oscillation (transient).
      iii) Maximum value of RRRV. **6**
   c) A 3-phase oil circuit breaker is rated at 1000 A, 1500 MVA, 33 KV, 4 second. Find the rated normal current, symmetrical breaking current, making current, short time rating. **4**
4. a) Enumerate the properties of SF_6 gas which render its use in high voltage circuit breakers. With the help of a neat sketch, explain the working of any one type of SF_6 circuit breaker. **8**
   b) List out the desirable properties of oil used in oil circuit breaker. **4**
   c) With a neat diagram, explain the operation of vacuum circuit breakers. Write the advantages of vacuum circuit breaker. **8**

P.T.O.

PART – B

5. a) What is protective relay ? Discuss the basic requirements of protective relaying. **10**

   b) With a diagram, explain zones of protection in a power system. **6**

   c) How are protective relays classified ? List them. **4**

6. a) What is directional over current relay ? Describe the operating principle, constructional features and areas of application of reverse power or directional relay. **8**

   b) The current rating of an over current relay is 5 A. PSM = 2, TSM = 0.3, CT ratio = 400/5, Fault current = 4000 A. Determine the operating time of the relay. At TSM = 1, operating time at various PSM are **4**

PSM	2	4	5	8	10	12
Operating time in secs	10	5	4	3	2.8	2.4

   c) With a suitable diagram, explain a negative sequence relay. **8**

7. a) With a neat sketch, discuss the differential scheme for bus-zone protection. **4**

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

   c) Explain the block diagram of phase comparison method of carrier current protection. **8**

8. a) With neat diagram explain the working of a static amplitude comparator. **8**

   b) Write short notes on : **12**

      i) solid state relays

      ii) Microprocessor based relay

      iii) Quadrilateral relay.

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