B.E.(with Credits)-Regular-Semester 2012-Electrical Engineering & (E. & P.) Sem VII
EP - Power System Protection & Switchgear

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Notes :   1.   All questions carry equal marks.
          2.   Illustrate your answers wherever necessary with the help of neat sketches.
          3.   Due credit will be given to neatness and adequate dimensions.
          4.   Assume suitable data wherever necessary.
          5.   Use of non programmable calculator is permitted.
          6.   Answer the questions as per internal choice given.

1.   a)   Explain the effect of interruption of low inductive current.   **8**

         b)   A 50 Hz, 3-phase alternator with grounded neutral has an inductance of 1.6 mH/ph and is   **8**
              connected to the bus bars through a circuit breaker. The capacitance to earth of the circuit
              between the alternator and the circuit breaker is 0.0032 μF/ph. Due to a short on the bus
              bars, the breaker opens when the rms value of the current is 8000 Amp. Determine the
              following –

              i)   Frequency of oscillation

              ii)   Active recovery voltage

              iii) Time for maximum RRRV

   iv)   Maximum RRRV

                                            OR

2.   Write short notes on following.

         a)   Buchholz's Relay.   **8**

         b) SF_6 circuit breaker.   **8**

3.   a)   Explain the terms relative to protective relay :   **6**
              i)   sensitivity
              ii)   stability
              iii) reliability
              iv)   selectivity

         b)   Justify, "Induction disc or electromagnetic relays can be equated to sine comparator".   **6**

         c)   Justify, "When back up protection operates a large portion of power system is   **4**
              disconnected".

                                            OR

4. a) Define directional relay angle. Draw the phasor diagram and circuit to active quadrature connection of directional over current relay. **8**

b) An earth fault develops at point 'F' on the feeder shown in figure and the fault current is 16,000 Amp. The IDMT relay at B has a plug setting of 125% and time multiplier setting of 0.2. The circuit breaker takes 0.20 sec to clear the fault and the relay error in each case 0.15 sec. For a plug setting of 200% on the relay A, determine the minimum TMS on that relay for it not to operate before the circuit breaker at B has cleared the fault. The relay operating characteristic is as below : **8**

P & M	2	4	5	8	10	20
Operating Time (sec)	10	5	4	3	2.8	2.4
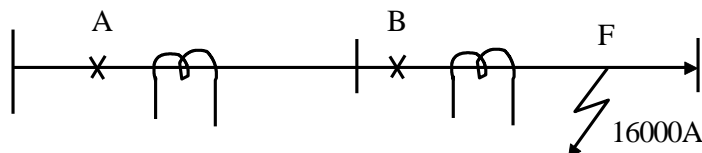
5. a) Explain the detailed circuit connections of three impedance relays with a directional unit used at a particular location for three zones of protection. **8**

b) Draw impedance reactance and mho characteristics to protect the 100% of the line having $(2.5 + j6)\Omega$ impedance. A fault may occur at any point on the line through an arc resistance of 2Ω. Determine the maximum percentage of line section which can be protected by each type of relay. **8**

OR

6. a) Explain power swing in detail and derive formula and differentiation with respect to fault. **8**

b) Explain the need of carrier protection. **4**

c) Effect of d.c. offset on reach of relay. **4**

7. a) Draw percentage differential protection scheme for delta-star connected transformer with polarity marking. **8**

b) Explain in brief problems arising in differential protection applied to transformer. **4**

c) A star-delta 11 kV/6.6 kV transformer is protected by means of differential protection system, the 6.6 kV delta connected side has CT ratio of 600/5. Calculate CT ratio on 11 kV side. **4**

OR

8. a) Draw the differential protection scheme for bus bar having 3-incoming lines and 4-outgoing lines. Explain the working during following condition : **6**
   i) Normal condition
   ii) External fault
   iii) Internal fault.

	b)	Discuss the various abnormal conditions in induction motor. Explain stator protection using overcurrent relay.	**5**
	c)	Explain the concept of restricted and unrestricted earth fault protection of generator and draw its diagram.	**5**
9.	a)	Compare static and electromagnetic relays.	**5**
	b)	Show that a mho relay characteristics can be obtained by using phase comparator.	**5**
	c)	Explain single phasing prevention.	**6**

OR

10.	a)	Describe the application of microprocessor based relaying system.	**5**
	b)	Write a brief note on SCADA interfacing and metering.	**8**
	c)	What is digital logic communication.	**3**

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