

Sample Question Paper

Course Name : Diploma in Electrical Engineering Group

Course Code : EE/EP

Semester : Fifth

Subject Title : Switchgear & Protection

Marks : 100

17508

Time: 3 hrs

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1.A) Attempt any THREE of the following:

(3x4=12)

- a) List any eight essential features of effective protective system.
- b) State any two advantages of using current limiting reactors. Show the any two locations where reactors are used in power system using single line diagram.
- c) Define the followings related to protective relay.
  - i) pick up current
  - ii) relay time
  - iii) plug setting multiplier
  - iv) reset current
- d) Name internal and external causes of system over voltages.

Q1.B) Attempt any ONE of the following:

(1x6=6)

- a) Figure 1 shows single line diagram of three phase system. The percentage reactance of each alternator is based on its own capacity. Find short circuit current that will flow in to a complete three phase short circuit at F.

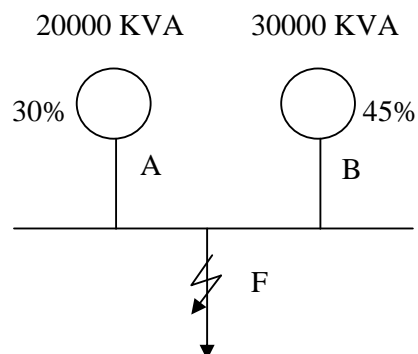


Figure 1

- b) A three phase, 33/6.6 KV, star/ delta connected transformer is protected by Mertz Price circulating current system. If the C.T's on low voltage side have ratio of 300/5, determine ratio of C.T's on high voltage side. Draw a neat diagram and indicate the given values at appropriate places.

**Q2. Attempt any FOUR of the following:**

**(4x4=16)**

- a) Define the following terms
- i) Arc voltage
  - ii) Recovery voltage
  - iii) Restriking voltage
  - iv)RRRV
- b) Draw neat labeled diagram of single filament HRC fuse.
- c) State any four types of lightning arresters with their particular application.
- d) State the meaning of the term Resistance earthing. List its any three advantages.
- e) Differential relays are more sensitive than overcurrent relays. True or False. Justify your answer.
- f) List the difficulties experienced in differential relay in Alternator protection. How are they overcome?

**Q3. Attempt any FOUR of the following:**

**(4x4=16)**

- a) Describe the Arc interruption process in Air Break circuit breaker incorporating i) arcing horns  
ii) arc splitters, with the help of diagram.
- b) Distinguish between functions of isolator and circuit breaker.
- c) Describe microprocessor based relay with the help of block diagram.
- d) Describe the operation of Buchholz Relay with reference to Principle of operation and Installation.
- e) Draw the restricted earth fault protection scheme for 500 MVA star/ delta transformer.

**Q4.A) Attempt any THREE of the following:**

**(3x4=12)**

- a) Describe the principle of Negative Phase Sequence circuit for Alternator protection with neat diagram.
- b) Describe working of surge absorber with the help of neat labeled diagram.
- c) "ELCB is must for an residential installation" Justify the statement.

- d) State what is the basis of preferring directional relays on ring Main system for Transmission line protection?

**Q4.B) Attempt any ONE of the following:**

**(1x6=6)**

- a) Describe suitable protection scheme used for overload protection of motors, with the help of neat labeled diagram.
- b) Describe fault bus protection of busbars, with neat labeled diagram.

**Q5.) Attempt any FOUR of the following:**

**(4x4=16)**

- a) Describe working principle of SF6 circuit breaker.
- b) Describe the working of horizontal break isolator with neat diagram.
- c) State the principle of operation of induction relays.
- d) Study the given figure 2 of induction type over current relay. Redraw the figure showing missing part and label the following points:
- i) Direction of current on secondary side
- ii) Trip circuit

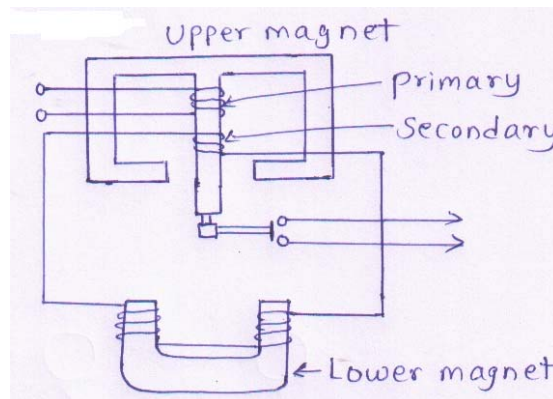


Figure 2

- e) Describe the construction of Induction type Directional Power relay, with the help of neat diagram.
- f) Describe the operation of solenoid type relay with the help of neat labeled diagram.

**Q6.) Attempt any FOUR of the following:**

**(4x4=16)**

- a) State what are the limitations under which differential protection scheme for transformers is used?
- b) State what are the conditions under which inverse time relay is adopted for distance protection of transmission line?

- c) “Relays can be used to sense Single phase open circuit fault in an alternator” State whether true or false. Justify your answer.
- d) Describe the basis for preferring biased differential protection scheme over simple differential protection for transformer protection?
- e) In the given figure 3, if fault occurs on i) feeder F and ii) near source. Redraw the separate diagram for each condition showing changed in current direction.

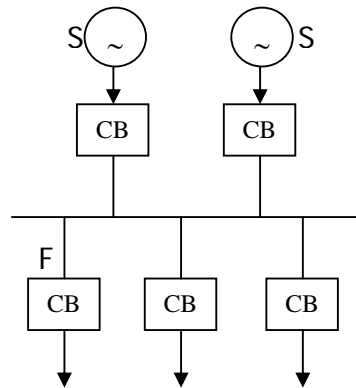


Figure 3