Total Pages—5

(Set-L)

B.Tech - 7th
Power System - III

Full Marks : 70

Time : 3 hours

Q. No. 1 is compulsory and answer any **five** questions from the rest

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2×10

   (*a*) Explain the terms, re-striking voltage and recovery voltage.

   (*b*) Why are adjacent zones made to overlap ?

   (*c*) Briefly explain symmetrical breaking current and asymmetrical breaking current.

   (*d*) What are the drawbacks of electro-mechanical relays ?

   (*e*) Write down the general equation by which the time delay is realized.

(*Turn Over*)

(*f*) What are the different types of phase comparators ?

(*g*) What is the function of an isolator ?

(*h*) Write down the average 3-Phase power in terms of symmetrical component.

(*i*) What is critical clearing angle ?

(*j*) Explain Tie-line load bias control.

2. (*a*) Explain how arc is initiated and sustained in circuit-breaker when the circuit-breaker contacts separate. 5

(*b*) The load current in a system is 100 A. The short circuit current for the smallest fault is 1000 A. An over current relay capable of carrying a current of 5 A continuously is to be used. 5

(*i*) Suggest a suitable CT ratio.

(*ii*) What will be the relay current for the smallest fault ?

(*iii*) Will the protective CT be able to faithfully reproduce the fault current ?

3. (*a*) With help of a neat diagram explain attractive armature type electromechanical relays. 5

(*b*) Calculate the PSM suitable for a relay setting of 150% if the fault current is 1500 A. The CT ratio is 150/5. Also determine the time of operation of the relay corresponding to PSM. If the time setting dial is set at 0·2 and the time of operation of the relay when set at 1·0 is 1·56. 5

4. (*a*) Four 50 MVA generators of 15% reactance each are connected via four 35 MVA reactors each of 10% reactance to a common bus-bar. The feeders are each connected to the junction of each alternator and its reactor. Determine the rating of each feeder circuit -breaker. 5

(*b*) Describe positive sequence network, negative sequence network and zero sequence network. What is their significance in fault analysis ? 5

5. (*a*) Differentiate between steady state stability and transient stability of a power system. Discuss the factors that affect : 5

(*i*) Steady state stability.

(*ii*) Transient state stability of the system.

(*b*) The generalized circuit constants of a nominal circuit representing a 3-phase transmission line are :

$A = D = 0{\cdot}980 \angle 0{\cdot}3^\circ$

$B = 82{\cdot}5 \angle 76{\cdot}0^\circ\ \Omega$

$A = D = 0{\cdot}0005 \angle 90^\circ$ mho

Determine the steady state stability limit if the sending and receiving end voltages are held at 220 V. 5

6. (*a*) Derive an expression for the re-striking voltage in terms of system voltage, inductance and capacitance across a C. B. contact when a 3-phase fault takes place. Assume the neutral of the system to be solidly grounded. 5

(*Continued*)

(*b*) Describe a Buchholz relay and discuss its merits and demerits. 5

7. (*a*) Four bus-bar sections have each a generator of 40 MVA 10% reactance and a bus-bar reactor of 8 % reactance. Determine the maximum MVA fed into a fault on any bus-bar section and also the maximum MVA if the number of similar bus-bars in sections is very large. 5

(*b*) Explain swing equation and discuss its application in the study of power system. 5

8. Write short notes on any *two* : 5 × 2

(*i*) Causes and countermeasures of voltage stability

(*ii*) Bus-bar arrangement

(*iii*) DC circuit breaker.
