Roll No. **Total No. of Pages : 04**

Total No. of Questions : 18

B.Tech. (EE / Electrical & Electronics Engg.) (2012 Onwards)

B.Tech. (Electronics & Electrical Engg.) (2012 to 2017) (Sem.7)

POWER SYSTEM ANALYSIS

Subject Code : BTEE-801

M.Code : 71930

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

Write briefly :

1. What are the advantages of Z-bus building algorithm?
2. What is necessity for power flow studies?
3. What change will occur in the admittance matrix when a line is out of service?
4. What change will occur in the admittance matrix when the turn ratio of a transformer varies?
5. Explain the significance of the phase shift operator 'a' in the analysis of three-phase circuits.
6. Outline the advantages of working with per unit quantities.
7. What is the meaning of kVA rating on a circuit breaker?
8. What is the purpose of single line diagram?
9. Who invented symmetrical components?
10. What is transient stability limit?

SECTION-B

11. Compute the bus admittance matrix for the power system shown in Fig. 1.

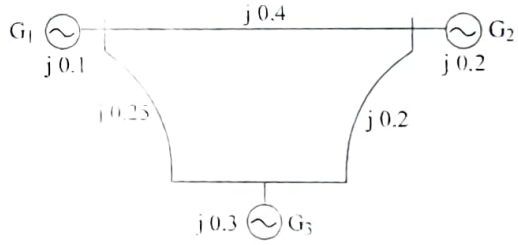

FIG. 1 : Power System Network

12. Categorize the various types of unsymmetrical faults and state the order of frequency of occurrence of shunt faults.

13. Under what condition is the system stable according to equal area criterion? Discuss in detail.

14. Discuss the possible solutions of the disturbed motion of a synchronous generator, connected to an infinite bus, when subjected to a small disturbance.

15. For the power system shown in Fig. 2, convert all quantities to pu values on a system base of 25 MVA. Assume a base voltage of 33 kV for the transmission line.

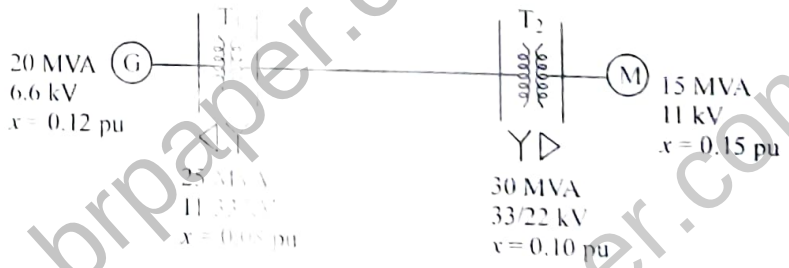

FIG. 2 : Power System Network

SECTION-C

16. Calculate the load flow of the power system shown in Fig.3 using Newton-Raphson method. [Note: Maximum iteration is 2]

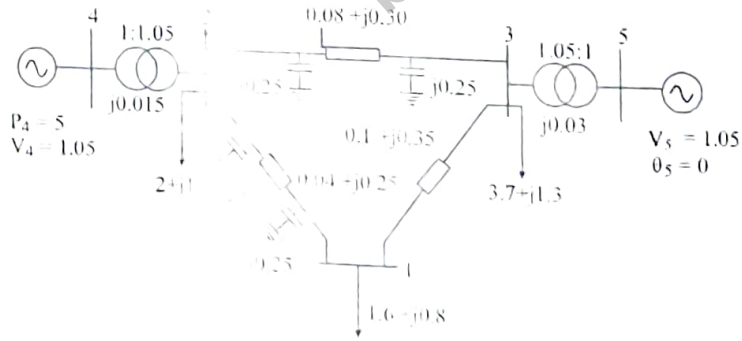

FIG. 3 : Power System Network

17. The zero sequence reactances for the various components of the power system shown in Fig. 4 are as follows :

Generator 1 : Star-connected 100 MVA, 11 kV, X_0 = 0.08 pu with star point earthed through a reactor of 3.0 Ω.

Generator 2 : Star-connected 50 MVA, 11 kV, X_0 = 0.05 pu with star point isolated.

Motor star-connected 25 MVA, 6.6 kV, X_0 = 0.05 pu with star point solidly earthed.

Transformers :

Between 1-2 : 100 MVA, 11/132 kV, delta-star with star point solidly earthed, X_0 = 0.1 pu.

Between 3-4 : 50 MVA, 132/6.6 kV, star-delta with star point solidly earthed, X_0 = 0.075 pu.

Between 4-5 : 50 MVA, 6.6/66 kV, star-star with both star point solidly earthed, X_0=0.08 pu.

Between 6-7 : 50 MVA, 66/11 kV, delta-delta, X_0 = 0.06 pu.

Between 7-8 : 75 MVA, 11/132 kV, delta-star with star point solidly earthed through a reactor of 3Ω. X_0 = 0.06 pu.

Line 2-3 : Zero sequence reactance X_0 = 300Ω

Line 2-8 : Zero sequence reactance X_0 = 250Ω

Line 5-6 : Zero sequence reactance X_0 = 200Ω

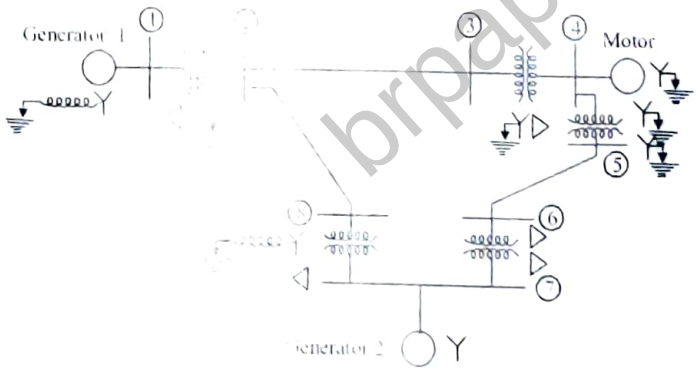

FIG. 4 : Single line diagram of power system

Draw the zero sequence network for the system.

18. A three-phase, 50-Hz synchronous generator is delivering 0.9 pu real power to an infinite bus via the transmission line shown in Fig. 5. All values shown in the circuit diagram are in per unit on a common system base. A temporary three-phase fault occurs in the middle of line 2. Determine the rotor angle position before the fault occurs. Assume H = 4.5 MJ/MVA.

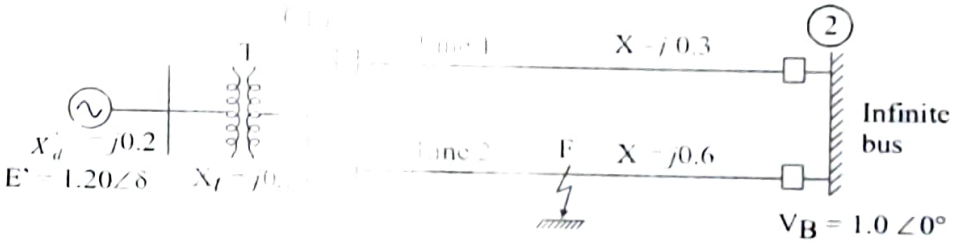

Fig. 5 : Circuit Diagram

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.