(Pages : 4) **B – 5995**

Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, April 2017
(2013 Scheme)
13.605 : POWER SYSTEM ANALYSIS AND STABILITY (E)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **(2×10=20 Marks)**

1. List the advantages of per unit (p.u.) quantity.
2. What are symmetrical components ?
3. How do you classify the types of buses ?
4. What is DC Load flow study ? Mention the assumptions made.
5. Discuss Unit Commitment (UC) and Load Scheduling (LC) problem.
6. What are the assumptions taken while treating constant loss coefficients ?
7. Discuss transient stability study in power system.
8. Differentiate between rotor angle stability and voltage stability of power system.
9. Discuss about AVR of an alternator.
10. What is one line diagram of a power system ?

P.T.O.

PART – B

Answer **any one** question from **each** Module. **(20×4=80 Marks)**

Module – I

11. a) Derive the sequence impedance of the symmetrical 3 phase transmission line section with neutral conductor. **8**

b) A 20 MVA, 11 kV, generator has a direct axis sub-transient reactance of 0.25pu. Its negative and zero sequence reactance are 0.35 pu and 0.1 pu respectively. The neutral of the generator is solidly grounded. Find the fault current, line-to-ground voltages and line-to-line voltages, when a single line to ground fault occurs at terminal of the unloaded generator. Neglect resistance. **12**

OR

12. a) Describe Z bus building Algorithm. **8**

b) A 30 MVA, 13.8 kV, 3 phase alternator has a sub-transient reactance of 15% and negative and zero sequence reactance of 15% and 5% respectively. The alternator supplies two motors over a transmission line having transformers at both ends as shown in Fig. 1. The motors have rated inputs of 20 MVA and 10 MVA both 12.5 kV with 20% sub-transient reactance, negative and zero sequence reactance of 20% and 5% respectively. The current limiting reactors of 2 ohm each are in the neutral of the alternator and the larger motor. The transformers are both rated 35 MVA, 13.2/115 kV with leakage reactance of 10%. Series reactance of the line is 80 ohms. The zero sequence reactance of the line is 200 ohms. Determine the fault current when L-G fault takes place at point P. **12**

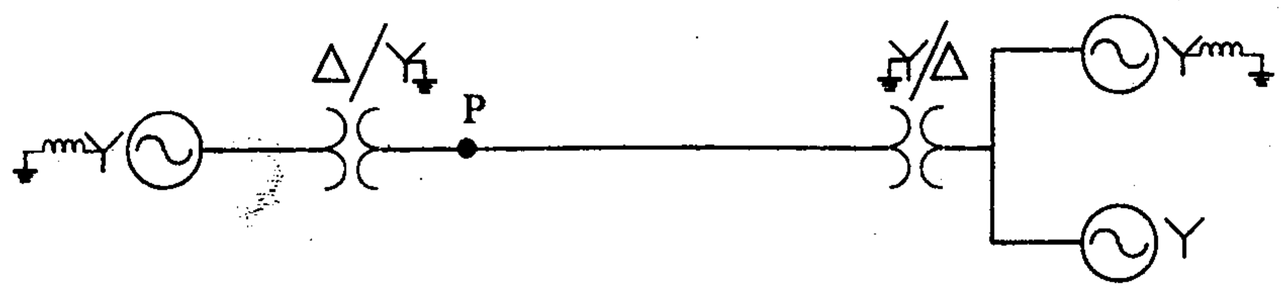

Fig. 1

Module – II

13. a) Explain the computational procedure for load flow solution using Newton-Raphson method when the system contains all types of buses. **10**

b) From Y_{bus} for the system shown in Fig. 2. The line impedances in pu are given. **10**

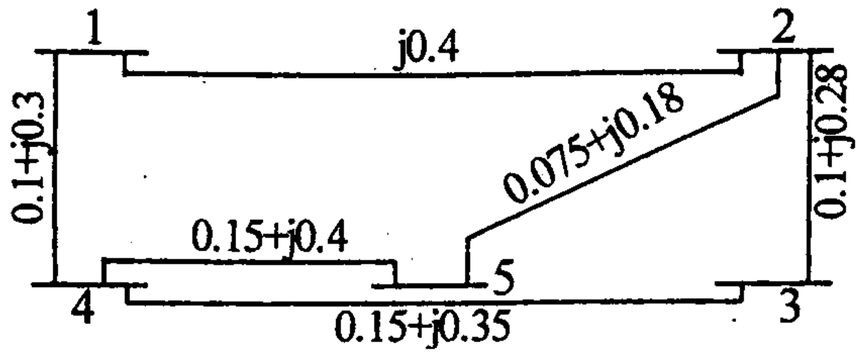

Fig. 2

OR

14. a) Compare the performance of Gauss-Seidel method and Newton-Raphson method of load flow solution using nodal admittance approach. **10**

b) Determine the set of load flow solution for the sample power system at the end of first iteration by N.R. method. **10**

$$Y_{bus}=\begin{bmatrix} 6.25-j18.75 & -1.25+j3.75 & -5+j15 \\ -1.25+j3.75 & 2.916-j8.75 & -1.666+j5 \\ -5+j15 & -1.666+j5 & 6.666-j20 \end{bmatrix}$$

Bus No.	P_G	Q_G	P_D	Q_D	V_{sp}
1	-	-	-	-	1.06
2	0.2	-	-	-	1.0
3	-	-	0.6	0.25	-

Module – III

15. a) Define input-output characteristics, heat rate and incremental fuel cost. **8**

b) Incremental fuel cost of two plans are given by

$\frac{dC_1}{dP_1} = 0.015P_1 + 2\,Rs/MWh; \frac{dC_2}{dP_2} = 0.012P_2 + 1.6\,Rs/MWh$. The limits on plants are $P_{min} = 20$ MW and $P_{max} = 125$ MW. Obtain the optimal schedule if the load varies from 50 to 250 MW. **12**

OR

16. a) Why it is necessary to consider transmission loss in optimal scheduling ? **8**

b) Two areas are interconnected as shown in Fig. 3. Total generating capacity in each is 600 MW. The fuel cost characteristics are given by

$$F_1 = 0.05P_1^2 + 20P_1 + 2000 \text{ Rs/h}$$

$$F_2 = 0.03091P_2^2 + 26P_2 + 2750 \text{ Rs/h}$$

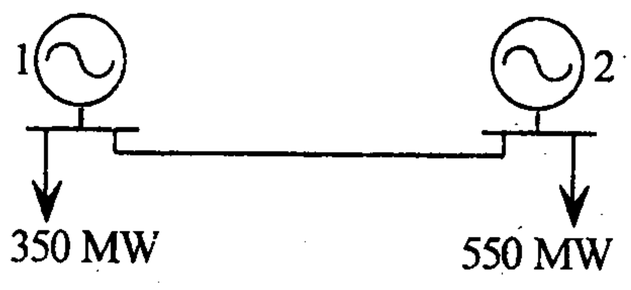

Fig. 3

Find the cost of generation if each area supplies its own load and plants are loading according to economic scheduling. Also find saving and tie line loading. Neglect transmission line losses. **12**

Module – IV

17. a) What is synchronous resonance ? Explain. **8**

b) A 50 Hz synchronous generator having an internal voltage 1.2 pu, H = 5.2 MJ/MVA and a reactance of 0.4 pu is connected to an infinite bus through a double circuit line, each line of reactance 0.35 pu. The generator is delivering 0.8 pu power and the infinite bus voltage is 1.0 pu. Determine Maximum power transfer. Steady state operating angle and natural frequency of oscillation if damping is neglected. **12**

OR

18. a) With a block diagram explain the representation of generator load model. **10**

b) A 50 Hz, 3 phase synchronous generator delivers 0.8 pu power to an infinite bus through a network of negligible resistance. A fault occurs which reduces the maximum transferable power from 1.5pu to 0.5 pu. After the clearance of fault the maximum transferable power is 1.2 pu. Determine the critical clearing angle. **10**