Register Number | | | | | | | |

SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E-EEE
Title of the Paper: Power system Analysis — Max. Marks: 80
Sub. Code: 614504 — Time: 3 Hours
Date: 18/11/2010 — Session: FN

PART - A (10 X 2 = 20)

Answer ALL the Questions

1. Define per unit value of any quantity.
2. A generator is rated 500MVA, 22kV. It star connected windings have a reactance of 1.1 pu. Find the ohmic value of reactance of the winding.
3. Z_{bus} of the partial network is available. To this a new branch is added. Write down the expression for the modified Z_{bus}.
4. Write Y pr in terms of incidence matrix.
5. The typical power system has symmetrical short circuit current I_{sc}. Write the expression for momentary fault current.
6. What is the purpose of symmetrical components?
7. What do you mean by the term bus switching?
8. Define mismatch.
9. On what factors does the stability of the system depend?
10. Distinguish steady state and transient stability.

PART – B (5 x 12 = 60)

Answer All the Questions

11. (a) A 3 ϕ transformer is rated 400MVA, 220Y/22Δ. The Y-equivalent short circuit impedance measured on the L.V. side of the transformer is 0.121 Ω. Determine the p.u reactance of the transformer and p.u

value to be used to represent this transformer in a system whose base on H.T. side of the transformer is 100 MVA, 230KV.

(b) What is the need for system analysis in planning and operation of power system? Explain.

(or)

12. (a) Explain the modeling of generator, load, shunt capacitor and transmission line for short circuit studies.

(b) The single line diagram of an unloaded power system is shown in figure. The reactance of the two section of the transmission lines are shown in the diagram. The generators and transformers are rated as follows:

G_1: 20 MVA, 13.8 kV, X_d = j0.2pu.

G_2: 30 MVA, 18 kV, X_d = j0.2pu

T_1: 25 MVA, 3 phase, 220 Y/13.8 Δ kV, X=10%

T_2: 3, single Phase units, each rated 10MVA, 127Y/18Δ kV

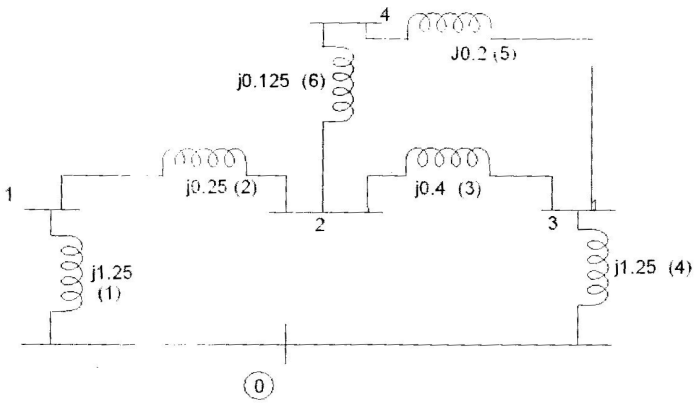
X= 10%

13. The reactance data in pu for a sample system is given in the table. Draw the single line diagram representing the system. Obtain Y_{bus} matrix by singular transformation method.

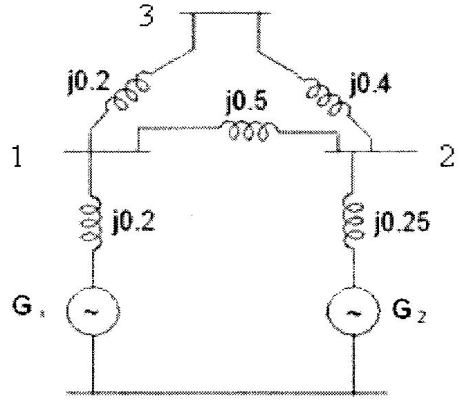
Line	X in pu
1.2	j 0.04
2.5	j 0.05
5-4	j 0.04
4-3	j 0.03
3-6	j 0.02
6-1	j 0.07
3-1	j 0.10

(or)

14. For the network shown in fugure, impedance labeled through 1 to 6 are in p.u. Formulate Zbus using building algorithm.



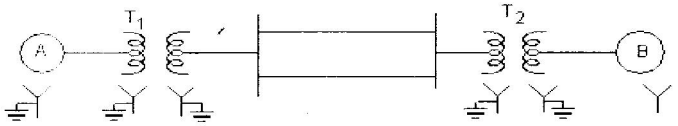
15. For the system network shown in figure, find the sub transient current from generator 1, line (1), (2) and the bus voltages (1) and (3) for a 3 phase fault at bus.(2)



Assume that no current is flowing prior to the fault and that the pre fault voltage at bus (2) is $1.0\angle 0$ p.u. Use the bus impedance matrix for calculations.

(or)

16. For the system shown in figure, draw the reduced sequence network and show their inter connection for a LLG fault at P and calculate the fault impedance.



	X_1	X_2	X_0 (all in p.u)
Generator A	0.3	0.2	0.05
Generator B	0.25	0.15	0.03
Transformer T1	0.12	0.12	0.12
Transformer T2	0.10	0.10	0.10
Each line	0.3	0.3	0.70

17. Discuss the importance of load flow problem. Formulate the load flow problem and describe the procedure of solving it using Newton Raphson method.

(or)

18. Consider a 3 bus system shown in figure 2. The details of line admittances, bus voltages and bus powers are given in table. Perform one iteration of Gauss-Seidel method.

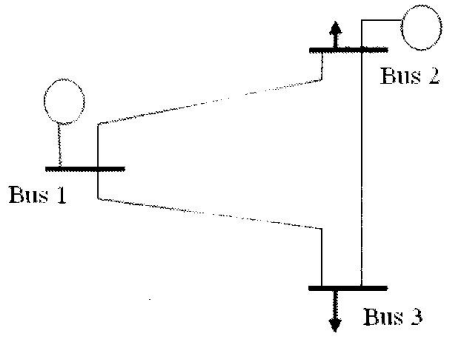


Table 1:

Bus Code	Impedances
1-2	0.08+j0.24
1-3	0.02+j0.06
2-3	0.06+j0.18

Table 2:

Bus No	Bus Voltages	P_D	Q_D	P_G	Q_G
1	1.05+j0	0	0	--	--
2	1.0+j0	50	20	20	0
3	1.0+j0	60	25	0	0

19. Explain the algorithm for transient stability simulation using modified Eulers method.

(or)

20. (a) Describe in brief about the Equal area criterion
(b) A generator operating at 50 Hz delivers rated power to an infinite bus. Power to an infinite bys when a fault occurs reduces and it is 0.4 p.u. The maximum power transferred during prefault os 1.75. the maximum power transferred during post fault is 1.25. Compute critical clearing angle.