SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E - EEE
Title of the paper: Power System Analysis
Semester: V — Max. Marks: 80
Sub.Code: 314504 — Time: 3 Hours
Date: 08-11-2008 — Session: FN

PART – A (10 x 2 = 20)

Answer All the Questions

1. What are the advantages of per unit system?

2. Write down the equations to convert symmetrical components into phase quantities.

3. State the importance of power flow studies.

4. Give the classification of buses in power flow studies.

5. Define short circuit capacity.

6. Distinguish between symmetrical and unsymmetrical faults.

7. Draw the sequence network connection for double line to ground fault on the terminals of an unloaded synchronous generator.

8. What is the type of fault that most frequently occurs on a power system?

9. List out the factors affecting transient stability.

10. State the equal area criterion of stability.

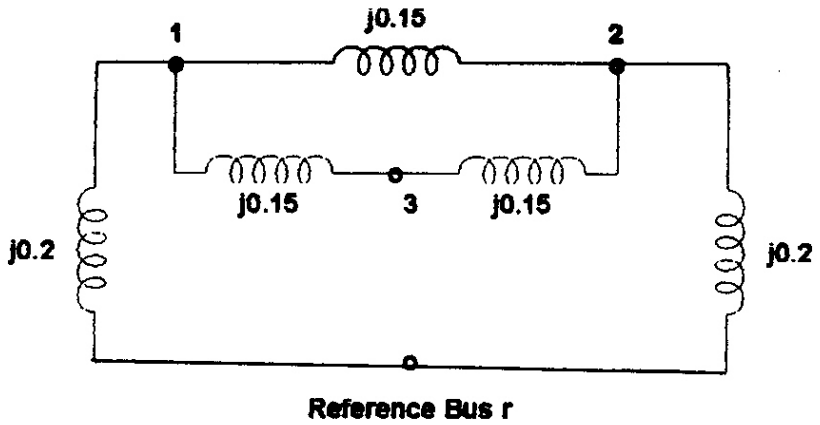
PART – B (5 x 12 = 60)

Answer All the Questions

11. (a) Give the step by step method of formulating Bus admittance matrix by singular transformation with suitable example.
(b) A single phase resistive load of 100 KVA is connected across lines BC of a balanced supply if 3 KV. Compute the symmetrical components of line currents.

(or)

12. A 3 bus network is shown in Fig. Q.No,. 12. Determine the bus impedance matrix of the network making use of Zbus building algorithm.



13. With the help of neat flow chart explain clearly how power flow analysis can be carried out by Newton-Raphson method with all types of buses being present in the system.

(or)

14. (a) Make a comparison of Gauss-Seidel load flow analysis and Newton Raphson load flow analysis. (4)
(b) For the network shown in Fig.Q.No.14b. obtain the complex busbar Voltage at Bus2 at the end of the first iteration by Gauss-Seidel method. Line impedance are given in per unit. (8)

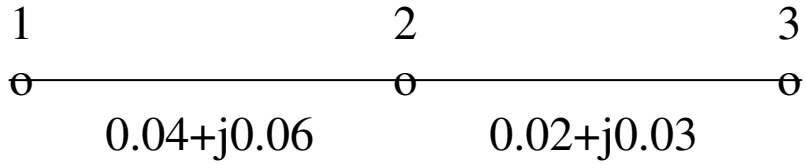


Fig Q.No.14b

Bus 1 is slack bus with $V_1 = 1.0 \angle 0°$ V

$P_2 + j\,Q_2 = (-5.96 + j\,1.46)$ pu.

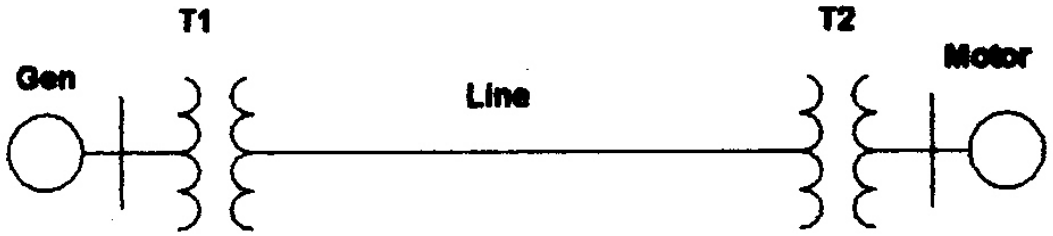
$|V_2| = 1.02$ pu

Assume $V_3° = 1.02 \angle 0°$ V and $V_2° = 1 \angle 0°$ V

15. With the help of detailed flow chart, explain how a symmetrical fault can be analysed using Zbus.

(or)

16. A synchronous generator and a synchronous motor each rated 25 MVA, 11 KV having 15% substransient reactance are connected through transformers and a line as shown in Fig. Q.No.16. The transformers are rated 25 MVA, 11/66 KV and 66/11 KV with leakage reactance of 10% each. The line has a reactance of 10% on a base of 25 MVA, 66 KV. The motor is drawing 15MW at 0.8 power factor leading and a terminal voltage of 10.6 KV when a symmetrical three phase fault occurs at the motor terminals. Find the subtransient current in the generator, motor and fault.



17. Derive the necessary equations for calculating the fault current and bus voltages for a line to line fault.

(or)

18. An unloaded solidly grounded 10 MVA, 11KV generator has positive, negative and zero sequence impedance as j1.2 ohm, j0.9 ohm and j0.04 ohm respectively. A double line to ground fault occurs at the terminals of the generator. Calculate the currents in the faulted line and voltage at the healthy line.

19. (a) Derive the swing equation describing the rotor dynamics for a synchronous machine.

(b) A 50 Hz four pole turbo generator rated 100 MVA, 11KV has an inertia constant of 8 MJ/MVA. If the mechanical input is suddenly raised to 80 MW for an electrical load of 50 MW, determine the rotor acceleration, neglecting losses.

(or)

20. Write short notes on
    (a) Modified Euler's method.
    (b) Runge Kutta method.