SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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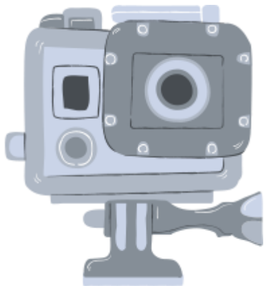
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 2

Network Modelling

19EET302 – Power System 1
III year / V Semester



INTRODUCTION

Bus Frame Analysis

FORMATION OF Y BUS AND Z BUS

1. Rule of Inspection
2. Singular Transformation
3. Non-Singular Transformation
4. ZBUS Building Algorithms, etc

Frames of Reference

Bus Frame of Reference: There are b independent equations (b = no. of buses) relating the bus vectors of currents and voltages through the bus impedance matrix and bus admittance matrix:

$$VBUS = ZBUS\ IBUS$$

$$IBUS = YBUS\ VBUS$$

Branch Frame of Reference: There are b independent equations (b = no. of branches of a selected Tree sub-graph of the system Graph) $VBR = ZBR\ IBR$

$$IBR = YBR\ VBR$$

Loop Frame of Reference: There are b independent equations (b = no. of branches of a selected Tree sub-graph of the system Graph)

$$VLOOP = ZLOOP\ ILOOP$$

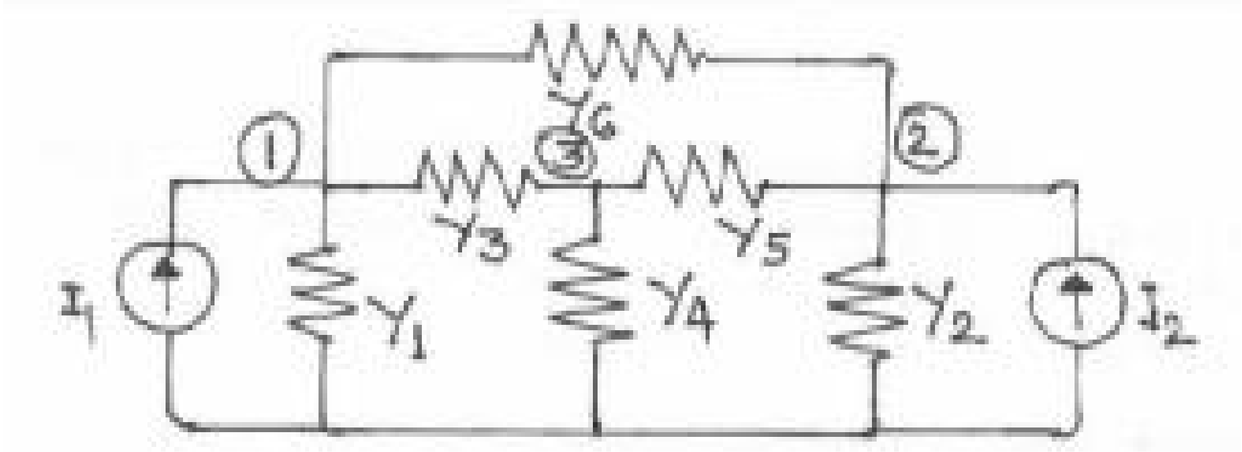
$$ILOOP = YLOOP\ VLOOP$$

Of the various network matrices refered above,

the bus admittance matrix (YBUS) and the bus impedance matrix (ZBUS) are determined for a given power system

Rule of Inspection
-Inspection Method

Consider the 3-node admittance network as shown in figure5. Using the basic branch relation: I = (YV), for all the elemental currents and applying Kirchhoff's Current Law principle at the nodal points, we get the relations as under:



At node 1: I1 =Y1V1 + Y3 (V1-V3) + Y6 (V1 – V2)
At node 2: I2 =Y2V2 + Y5 (V2-V3) + Y6 (V2 – V1)
At node 3: 0 = Y3 (V3-V1) + Y4V3 + Y5 (V3 – V2)

Inspection Method

$$\begin{vmatrix} I_1 \\ I_2 \\ 0 \end{vmatrix} = \begin{vmatrix} (Y_1+Y_3+Y_6) & -Y_6 & -Y_3 \\ -Y_6 & (Y_2+Y_5+Y_6) & -Y_5 \\ -Y_3 & -Y_5 & (Y_3+Y_4+Y_5) \end{vmatrix} \begin{vmatrix} V_1 \\ V_2 \\ V_3 \end{vmatrix}$$

IBUS = YBUS VBUS

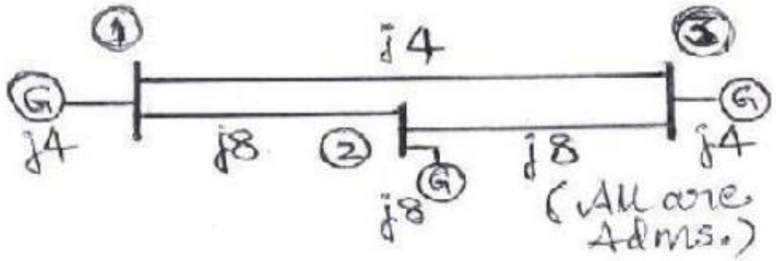
Where, YBUS is the bus admittance matrix, IBUS & VBUS are the bus current and bus voltage vectors respectively.

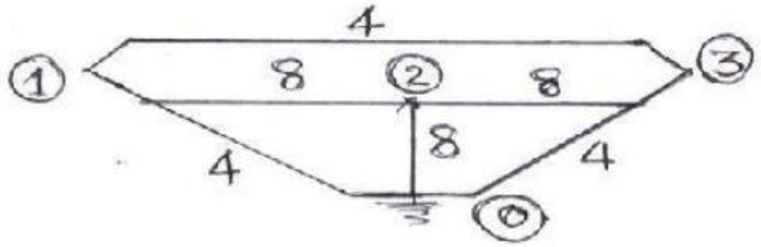
Diagonal elements: A diagonal element (Yii) of the bus admittance matrix, YBUS, is equal to the sum total of the admittance values of all the elements incident at the bus/node i,

Off Diagonal elements: An off-diagonal element (Yij) of the bus admittance matrix, YBUS, is equal to the negative of the admittance value of the connecting element present between the buses I and j, if any.

Problem 1

- Obtain the bus admittance matrix for the admittance network shown aside by the rule of inspection





$$Y_{BUS} = \begin{vmatrix} 16 & -8 & -4 \\ -8 & 24 & -8 \\ -4 & -8 & 16 \end{vmatrix}$$

Summary

Activity

KEEP
LEARNING..

Thank u

SEE YOU IN NEXT CLASS