EXPERIMENT NO. - 09

AIM: Formulation and calculation of Y-bus matrix of a system.

APPARATUS: MATLAB Software

THEORY:

The Y_{bus} /Z_{bus} matrix constitutes the models of the passive portions of the power network. Y_{bus} matrix is often used in solving load flow problems. It has gained widespread applications owing to its simplicity of data preparation and the ease with which the bus admittance matrix can be formed and modified for network changes. Of course, sparsity is one of its greatest advantages as it heavily reduces computer memory and time requirements. In short circuit analysis, the generator and transformer impedances must also be taken into account. In contingency analysis, the shunt elements are neglected, while forming the Z-bus matrix, which is used to compute the outage distribution factors.

This can be easily obtained by inverting the Y-bus matrix formed by inspection method or by analytical method. The impedance matrix is a full matrix and is most useful for short circuit studies. Initially, the Y-bus matrix is formed by inspection method by considering line data only. After forming the Y-bus matrix, the modified Y-bus matrix is formed by adding the generator and transformer admittances to the respective diagonal elements and is inverted to form the Z-bus matrix.

The performance equation for a n-bus system in terms of admittance matrix can be written as

$$\begin{bmatrix} I_1 \\ I_2 \\ . \\ . \\ I_n \end{bmatrix} = \begin{bmatrix} Y_{11} & Y_{12} & .... & Y_{1n} \\ Y_{21} & Y_{22} & .... & Y_{2n} \\ . & & & . \\ . & & & . \\ Y_{n1} & Y_{n2} & .... & Y_{nn} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ . \\ . \\ V_n \end{bmatrix}$$

(or)

$$I = Y_{bus} . V$$

The admittances Y_{11}, $Y_{12,...}$ Y_{1n} are called the self-admittances at the nodes and all other admittances are called the mutual admittances of the nodes.

Formulae Used:

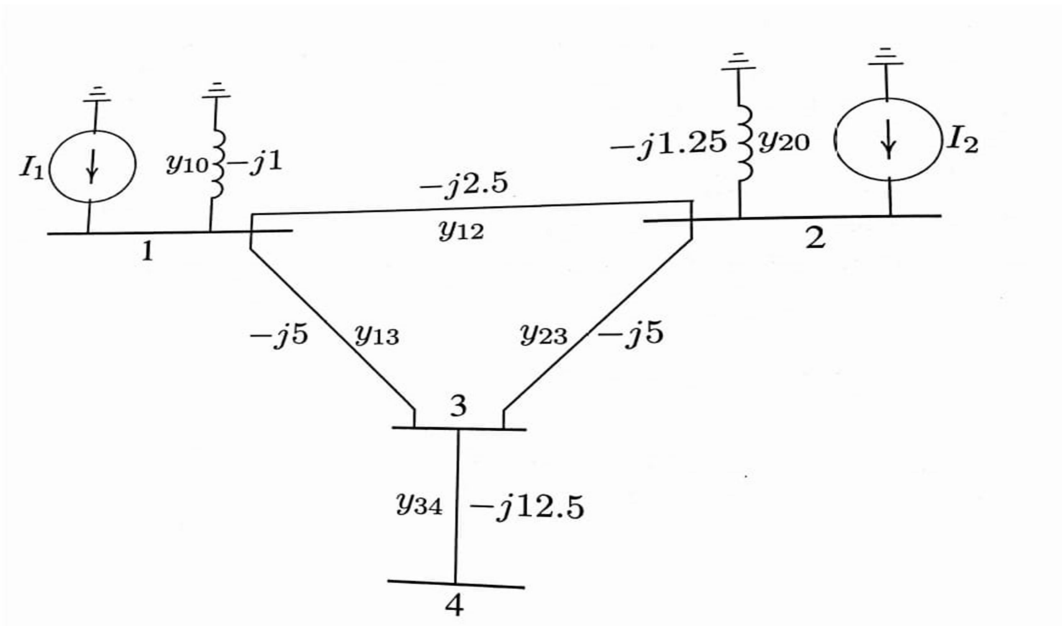
Main diagonal element in Y-bus matrix = $\sum_{J=1} Y_{ij} + B_{ij}$

where B_{ij} is the half line shunt admittance in mho

Y_{ij}.is the series admittance in mho.

Off-diagonal element in Y-bus matrix ,Y_{ij} = -Y_{ij}

Circuit Daigram:



PROGRAM:

```
clc
clear all
disp('------Y BUS Formation------');
x=input ('Enter the number of nodes:  ');

for i=1:1:x
    for j=1:1:x
        if(i==j)
           a(i,j)= input(strcat('Enter the value of
admittance Y',int2str(i),int2str(0),':'));
        else
           a(i,j)= input(strcat('Enter the value of
admittance Y',int2str(i),int2str(j),':'));
        end
    end
end
b=a; y=0;
for i=1:1:x
    for j=1:1:x
```

```
        if i==j
            for k=1:1:x
                y=y+b(i,k);
            end
            a(i,j)=y;
            y=0;
        else
            a(i,j)= -b(i,j);
        end
    end
end
b;
YBUS=a;
```

INPUT:

Enter no. of buses: 4

Y10= -1	Y12= -2.5	Y13= -5	Y14= -0	Y21= -2.5	Y22= -1.25	Y23= -5
Y24= -0	Y31= -5	Y32= -5	Y30= 0	Y34= -12.5	Y41= 0	Y42= 0
Y43= -12.5	Y40= 0					

Result:

Conclusion:

Question:

1. What is Primitive network.
2. What is the power flows between bus 1 and 2 .
3. What is load flow analysis.
4. Use of load flow studies in power system.
5. Classify the buses to carry out load flow analysis in power system.
6. Define i) Tree and co-tree ii) Basic loop.
7. What is bus incidence matrix.
8. What are the advantage of Y-bus for load flow studies.
9. Define per unit value of any electrical quantity.
10. Write the equation for converting p.u. impedance expressed in one base to another.
11. Define base impedance and base kilovoltamperes.

Faculty In-Charge