SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIT – I
Representation of Power System
Z- Bus Building Algorithm

Flow of Presentation

1. Introduction

2. Addition of branch and link

3. Case – 1 Modification

4. Case – 2 Modification

5. Case – 3 Modification

6. Case – 4 Modification

Introduction

1. **Step by Step programmable technique**

2. **Proceeds branch by branch**

3. **Advantageous as complete rebuilding not required**
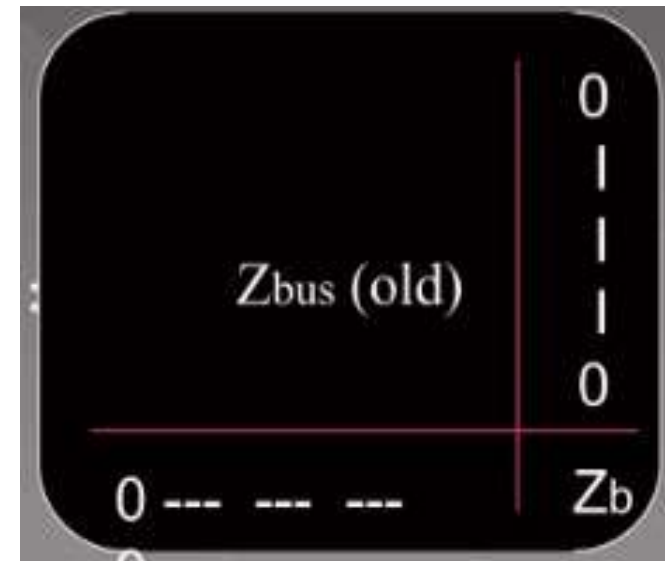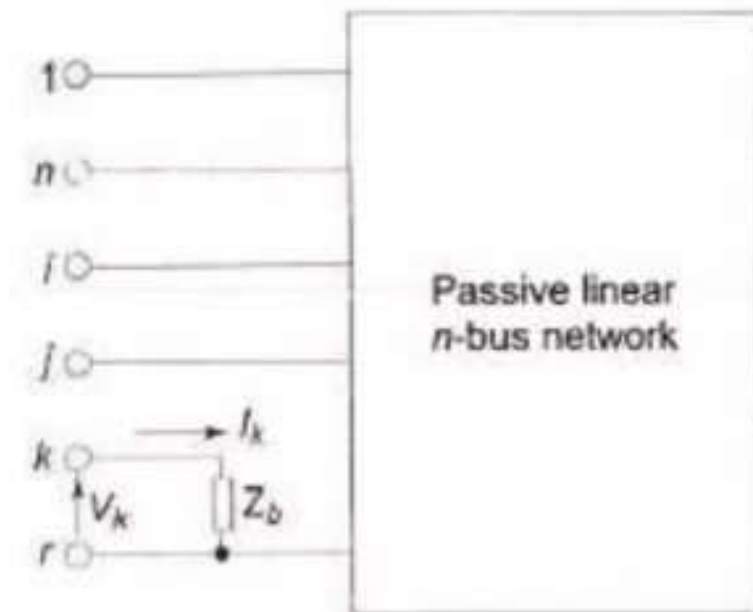
Four Different Ways

1. **Case 1: Adding a branch of impedance from new bus –p to the reference bus.**

2. **Case 2: Adding a branch of impedance from new bus –p to an existing bus q.**

3. **Case 3: Adding a branch of impedance from an existing bus q to the reference bus.**

4. **Case 4: Adding a branch of impedance between two existing buses h and q**

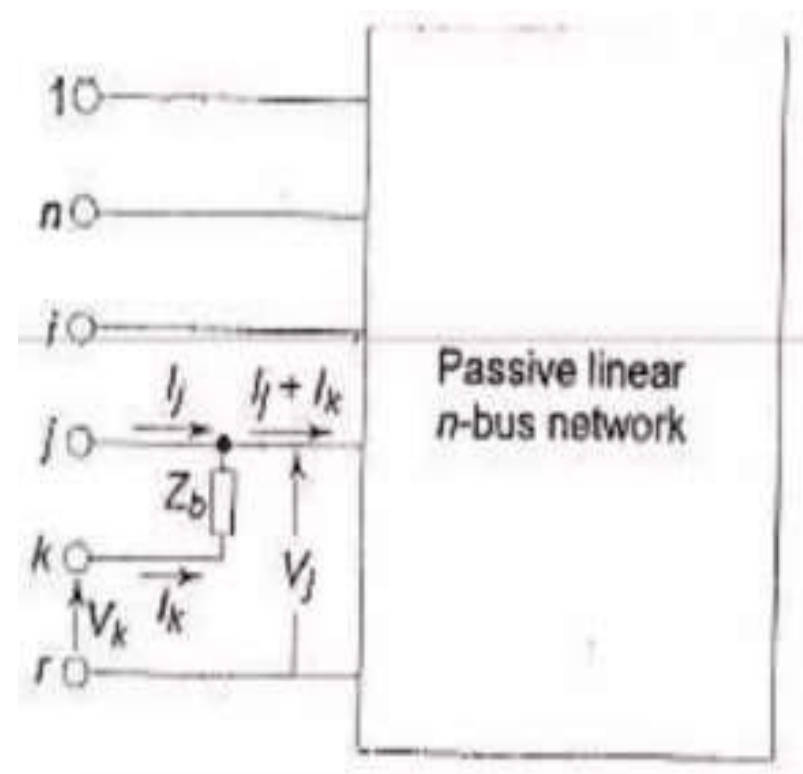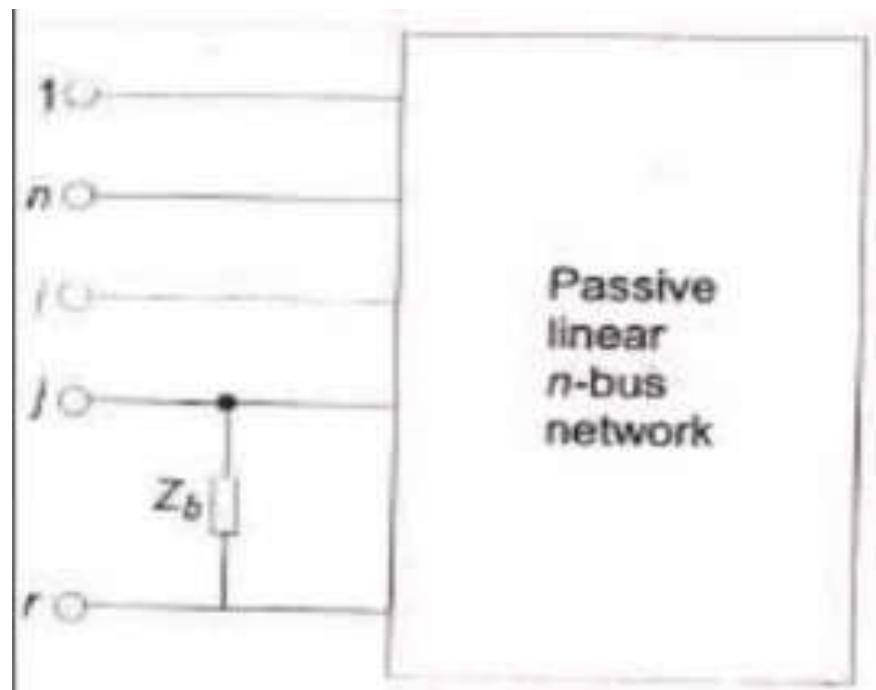1. **Case 1: Adding a branch of impedance from new bus –k to the reference bus.**

1. **Case 2: Adding a branch of impedance from new bus –p to an existing bus q.**

$$Z_{BUS}(\text{new}) = \begin{bmatrix} Z_{BUS}(\text{old}) & \begin{matrix} Z_{1j} \\ Z_{2j} \\ \vdots \\ Z_{nj} \end{matrix} \\ \hline Z_{ji}Z_{j2}\ldots Z_{jn} & Z_{jj}+Z_b \end{bmatrix}$$

1. **Case 3: Adding a branch of impedance from an existing bus q to the reference bus.**

$$\begin{bmatrix} V_1 \\ V_2 \\ \vdots \\ V_n \\ \hline 0 \end{bmatrix} = \left[\begin{array}{c|c} & Z_{1j} \\ & Z_{2j} \\ Z_{BUS}(old) & \vdots \\ & Z_{nj} \\ \hline Z_{j1} Z_{j2} \dots Z_{jn} & Z_{jj} + Z_b \end{array} \right] \begin{bmatrix} I_1 \\ I_2 \\ \vdots \\ I_n \\ \hline I_k \end{bmatrix}$$

$$Z_{BUS}(new) = Z_{BUS}\left(old - \frac{1}{Z_{jj} + Z_b} \begin{bmatrix} Z_{1j} \\ \vdots \\ Z_{nj} \end{bmatrix} [Z_{j1} \dots Z_{jn}]\right)$$

1. **Case 4: Adding a branch of impedance between two existing buses h and q**
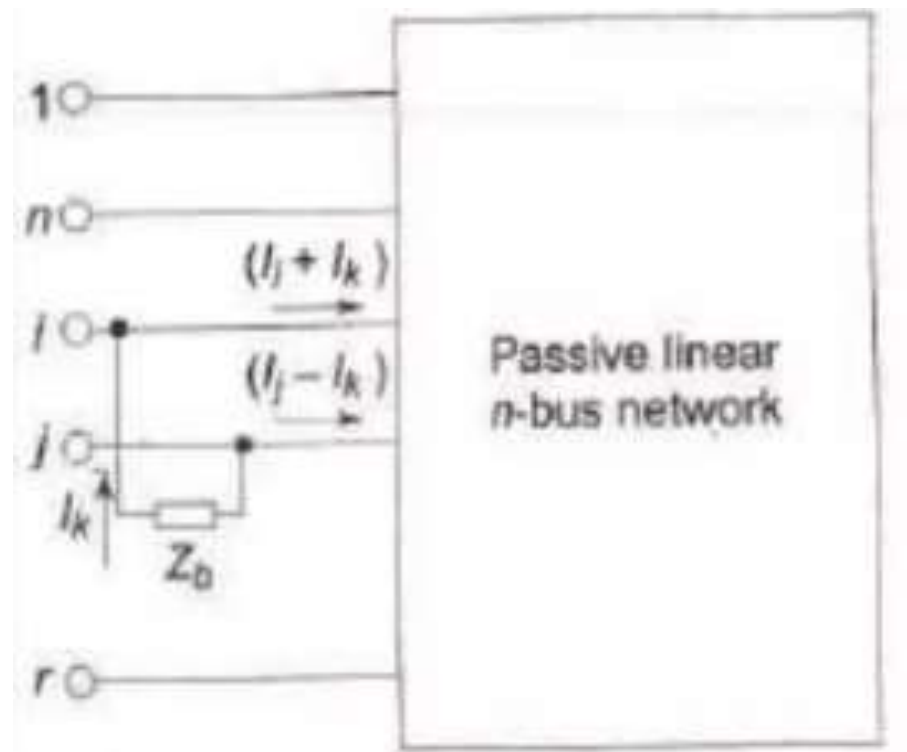
$$
\begin{bmatrix} V_1 \\ V_2 \\ \vdots \\ V_n \\ \hline - \\ 0 \end{bmatrix} = \left[\begin{array}{c|c} Z_{BUS} & \begin{array}{c} (Z_{1i} - Z_{1j}) \\ | \\ (Z_{ni} - Z_{kj}) \end{array} \\ \hline (Z_{i1} - Z_{j1})\ldots(Z_{in} - Z_{jn}) & Z_b + Z_{ii} + Z_{jj} - 2Z_{ij} \end{array}\right]
$$

ASSESMENT

1. In determining a Z bus matrix what is the procedure to be followed while we connect both existing busses.

Representation of Power System