



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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 ELECTRONICS & COMMUNICATION ENGINEERING

OPTICAL AND MICROWAVE ENGINEERING

III YEAR/ VI SEMESTER

1

UNIT 1 – MICROWAVE PARAMETERS

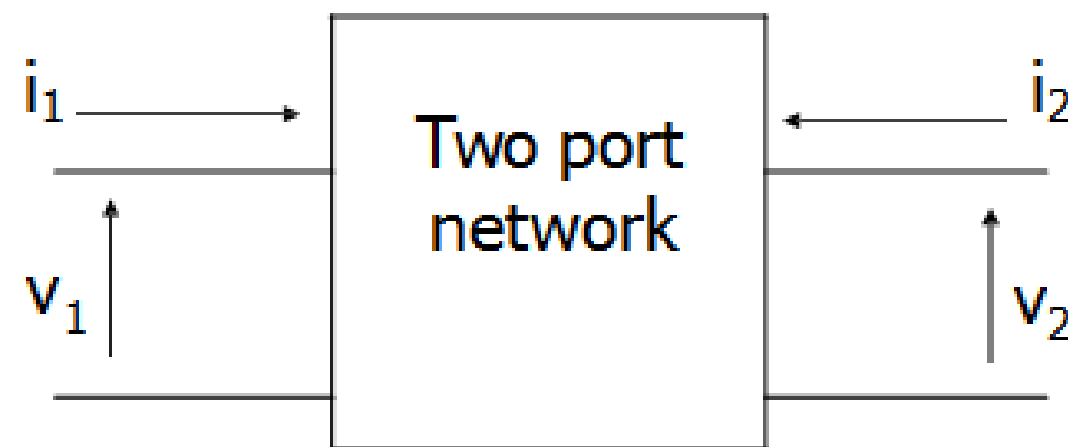
TOPIC – ABCD PARAMETERS



Two-Port Network



2-port networks are often described by using z , y , h , or ABCD parameters.





Drawbacks of Y, Z parameters

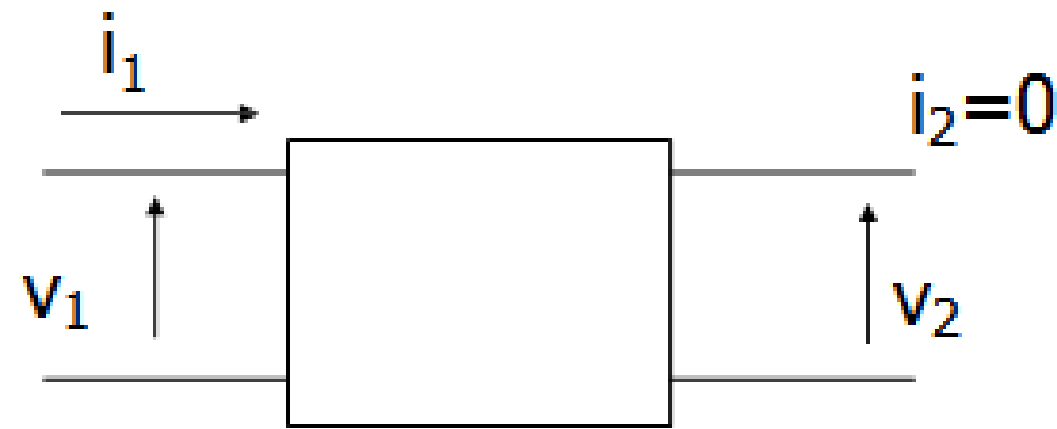
- At microwave frequency, total voltage and current are difficult to measure.
- Ideal open- and short-circuit terminations are difficult to realize.
- Active devices may oscillate under open- or short-circuit conditions.



ABCD-parameters

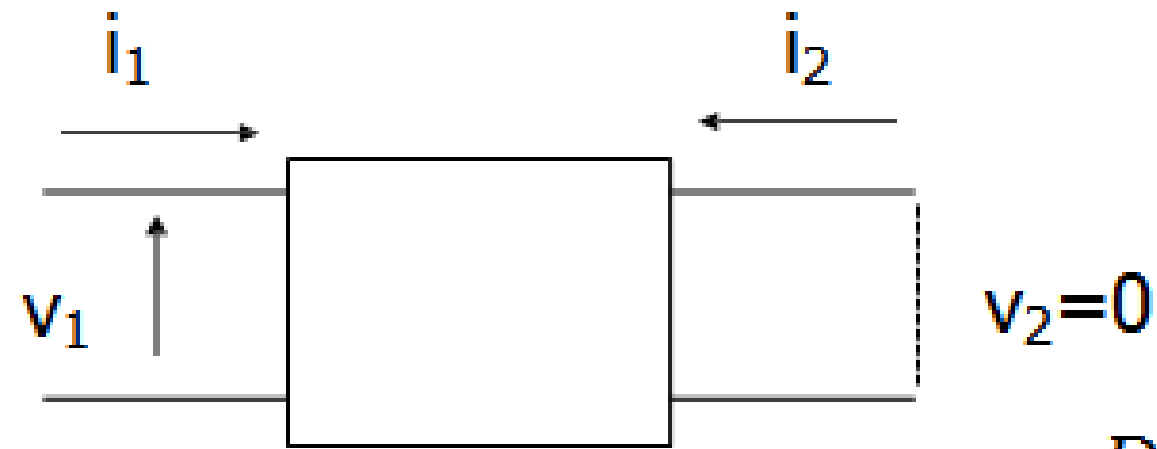


$$A = \left. \frac{v_1}{v_2} \right|_{-i_2=0}$$



$$C = \left. \frac{i_1}{v_2} \right|_{-i_2=0}$$

$$B = - \left. \frac{v_1}{i_2} \right|_{v_2=0}$$



$$D = - \left. \frac{i_1}{i_2} \right|_{v_2=0}$$



ABCD-parameters



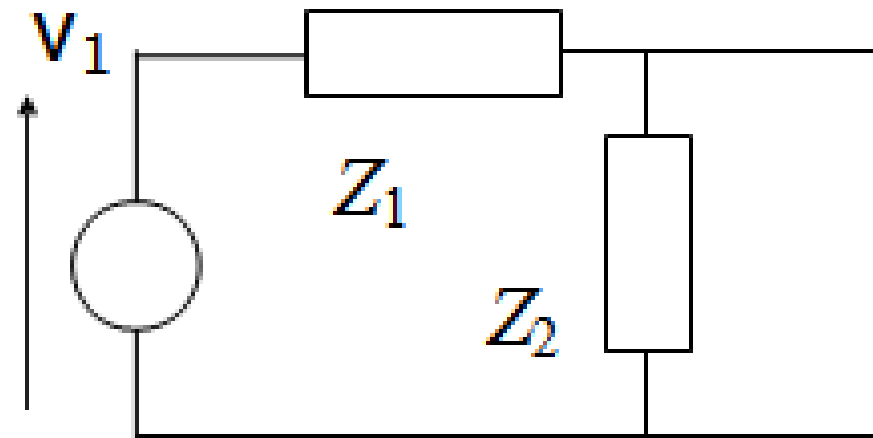
$$\begin{aligned}v_1 &= Av_2 + B(-i_2) \\ i_1 &= Cv_2 + D(-i_2)\end{aligned} \quad \longrightarrow \quad \begin{bmatrix} v_1 \\ i_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} v_2 \\ -i_2 \end{bmatrix}$$

where

$$A = \left. \frac{v_1}{v_2} \right|_{-i_2=0} \qquad B = - \left. \frac{v_1}{i_2} \right|_{v_2=0}$$
$$C = \left. \frac{i_1}{v_2} \right|_{-i_2=0} \qquad D = - \left. \frac{i_1}{i_2} \right|_{v_2=0}$$



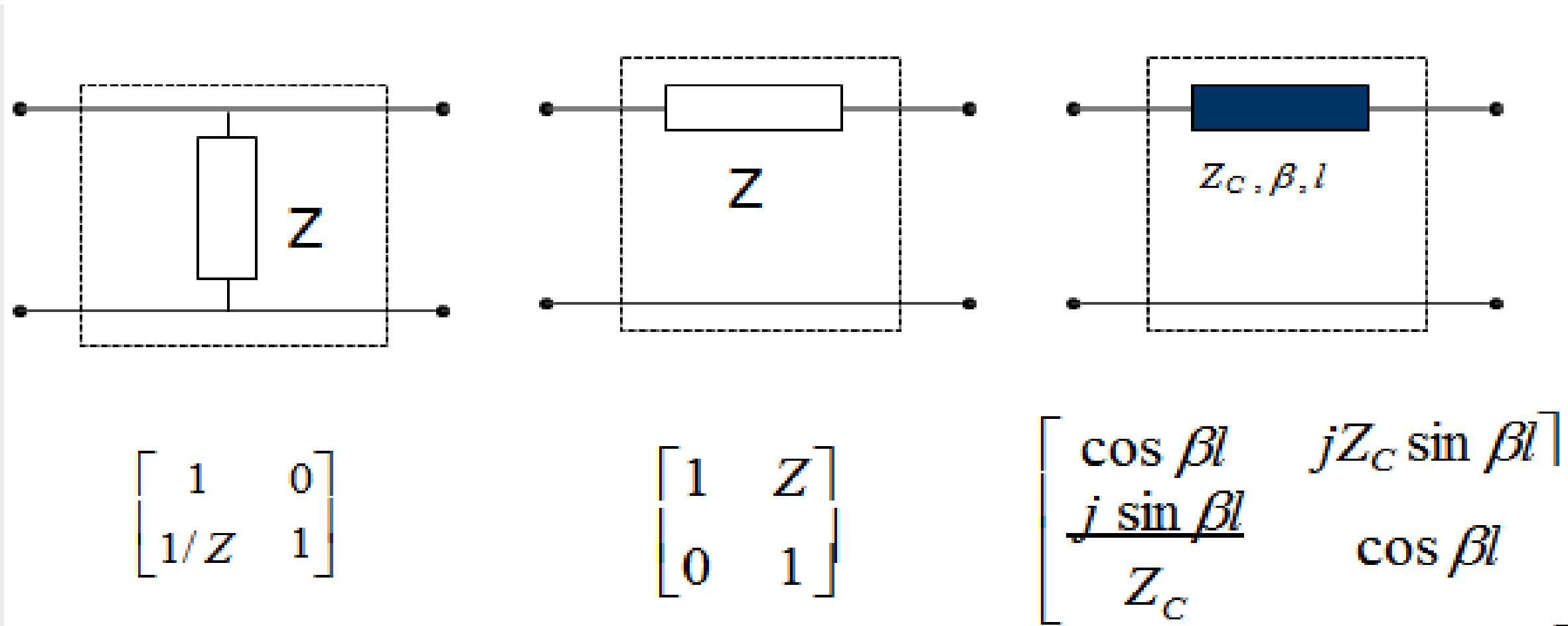
Example (ABCD-parameters)



$$D = - \left. \frac{i_1}{i_2} \right|_{v_2=0} \longrightarrow \begin{array}{l} i_2 = -i_1 \\ D = 1 \end{array}$$

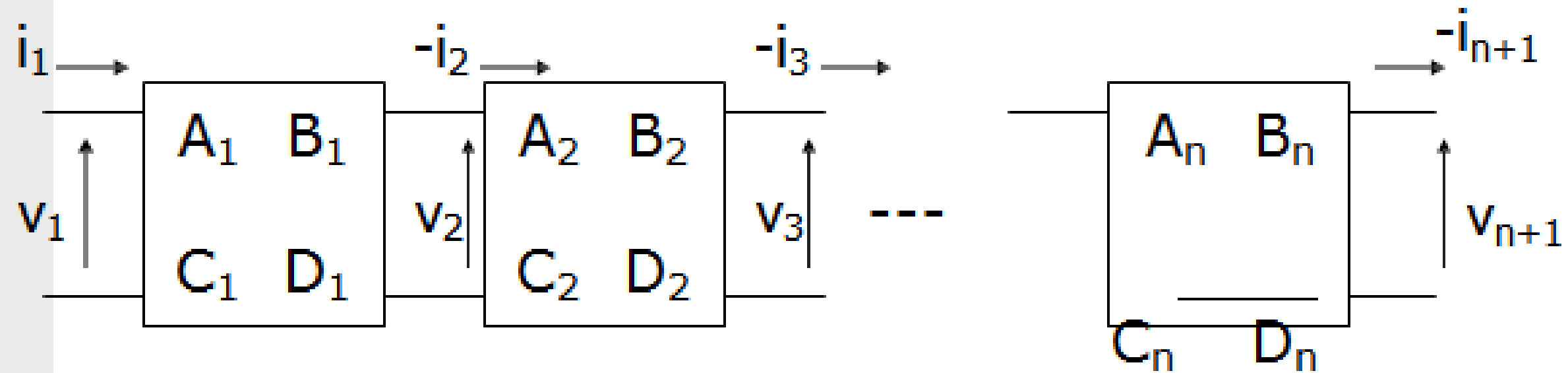


ABCD-(circuit examples)





ABCD-(Cascaded circuit)



$$\begin{bmatrix} v_1 \\ i_1 \end{bmatrix} = \begin{bmatrix} A_T & B_T \\ C_T & D_T \end{bmatrix} \begin{bmatrix} v_{n+1} \\ -i_{n+1} \end{bmatrix}$$

$$\begin{bmatrix} A_T & B_T \\ C_T & D_T \end{bmatrix} = \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix} \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix} \cdots \begin{bmatrix} A_n & B_n \\ C_n & D_n \end{bmatrix}$$



THANK YOU