HYBRID PARAMENTERS

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***Abstract*- Through this paper we tend to propose the hybrid parameters of two port network. This circuit is often selected when a current amplifier is wanted at the output. The resistors shown in the diagram can be general impedances instead.Notice that off-diagonal h-parameters are dimensionless, while diagonal members have dimensions the reciprocal of one another.**

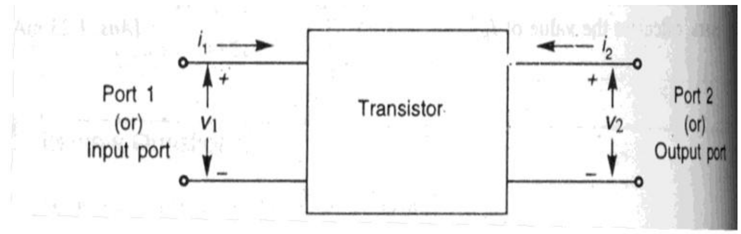
***Index Terms*- Rotar, stator, seperately excitation, self excitation, series excitation, shunt excitation, compound excitation.**

I. INTRODUCTION

The hybrid parameters are generally used to determine amplifier characteristic parameters such as voltage gain, input and output resistance etc. we have already know that amplifier characteristic parameters may be determined by using current gain(β) and values of other circuit components. Every linear circuit haing input and output can be analysede a s two port networks. In these networks there are four parameters called hybrid or h-parameters. Out of these four parameters, one is measured in ohm, one in mho and other two are dimension less. Since these parameters hae mixed dimension, so they are called hybrid parameters.

II. DISCUSSION

→ A transistor can be treated as a two part network. The terminal behaviour of any two part network can be specified by the terminal voltages V_1 & V_2 at parts 1 & 2 respectively and current i_1 and i_2, entering parts 1 & 2, respectively, as shown in figure.Of these four variables V_1, V_2, i_1 and i_2, two can be selected as independent variables and the remaining two can be expressed in terms of these independent variables. This leads to various two part parameters out of which the following three are more important.



Consider a linear circuit shown in Figure (a). in this circuit when input oltage 1 is applied, input current i_1 flows. Then output voltage V_2 and current i_2 appears. Both currents i_1 and i_2 are assumed to flow inside the box of the linear circuit. Both oltages V_1 and V_2 are assumed to be positive from the upper to lower terminals.

The circuit of the basic two port network is shown on the right. Depending on the application, it may be used in a number of

different ways to develop different models. We will use it to develop the h-parameter

model.The h-parameter model is typically suited to transistor circuit modeling. It is important

because:

1. Its values are used on specification

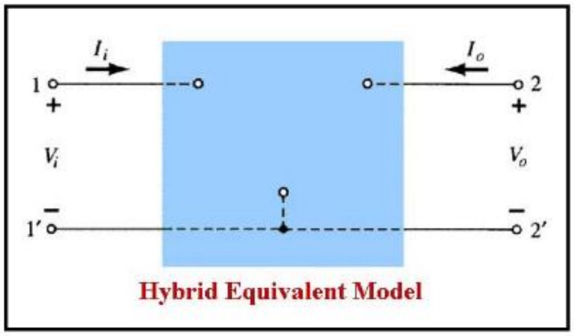
sheets

2. It is one model that may be used to analyze circuit behavior

3. It may be used to form the basis of a more accurate transistor model

The h parameter model has values that are complex numbers that vary as a function of:

1. Frequency
2. Ambient temperature
3. Q-Point



Hybrid Equivalent Model

→ If the input current i_1 and output Voltage V_2 are takes as independent variables, the input voltage V_1 and output current i_2 can be written as

$$V_1 = h_{11}\, i_1 + h_{12}\, V_2$$
$$i_2 = h_{21}\, i_1 + h_{22}\, V_2$$

The four hybrid parameters h_{11}, h_{12}, h_{21} and h_{22} are defined as follows.

$h_{11} = [V_1 / i_1]$ with $V_2 = 0$

= Input Impedance with output part short circuited.

$h_{22} = [i_2 / V_2]$ with $i_1 = 0$

= Output admittance with input part open circuited.

$h_{12} = [V_1 / V_2]$ with $i_1 = 0$

= reverse voltage transfer ratio with input part open circuited.

$h_{21} = [i_2 / i_1]$ with $V_2 = 0$

= Forward current gain with output part short circuited

The h-parameter model is defined by:

$$\begin{vmatrix} V_1 \\ I_2 \end{vmatrix} = \begin{vmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{vmatrix} \begin{vmatrix} I_1 \\ V_2 \end{vmatrix}$$

V1= h11I1+h12V2 KVL)
I2= h21I1+ h22V2 (KCL)

The h-parameter model for the common emitter circuit is on the right.

1. Short Circuit Input Impedance
h11= ZIN with output shorted <Ω>

$$h11= \left.\frac{V_i}{I_i}\right|_{V_O = 0}$$

a. Short terminals 2 2’
b. Apply test source Vi to terminal
c. Measure Ii
d. Calculate h11

2.Open Circuit reverse transfer Ratio
h12<dimensionless>
a. Open terminals 1 1’
b. Apply test source V2 to terminal 2 2’
c. Measure Vi
d. Measure Vo
e. Calculate h12

3. Short Circuit Forward Transfer Ratio
h21= <dimensionless>

$$h_{21} = \left.\frac{I_o}{I_i}\right|_{V_O = 0}$$

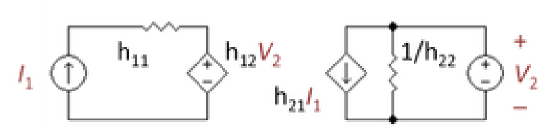
a. Short terminals 2 2’
b. Apply test source Vi to terminal 1
c. Measure Ii
d. Measure Io
e. Calculate h21.

4. Open Circuit Output Admittance
h22<Siemans>

$$h_{22} = \left.\frac{I_o}{V_o}\right|_{I_i = 0}$$

a. Open terminals 1 1’
b. Apply test source V2 to terminal 2
c. Measure Io
d. Measure Vo
e. Calculate h21

This circuit is often selected when a current amplifier is wanted at the output. The resistors shown in the diagram can be general impedances instead.



Uses :-

1. analyzed as two-ports are filters, matching networks, transmission lines, transformers, and small-signal models for transistors

2. The analysis of passive two-port networks is an outgrowth of reciprocity theorems first derived by Lorentz

III. CONCLUSION

The two-port network model is used in mathematical circuit analysis techniques to isolate portions of larger circuits. A two-port network is regarded as a "black box" with its properties specified by a matrix of numbers. This allows the response of the network to signals applied to the ports to be calculated easily, without solving for all the internal voltages and currents in the network.

REFERENCES

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