CAIRO UNIVERSITY		ELECTRONICS AND COMMUNICATION DEPT.
FACULTY OF ENGINEERING		2^{nd} Year
Two-Port Networks	*ELECTRIC CIRUITS*	*Sheet (6)*

[1]Determine the O.C. Z – parameters for the network shown in Fig. 1. Sketch its Z – parameters' equivalent circuits.

[2]Determine the S.C. Y – parameters for the network shown in Fig. 2. Sketch the two forms of its equivalent circuit.

[3]Calculate the Hybrid H – parameters for the network given in Fig. 1 and sketch its equivalent circuit.

[4]For the Hybrid equivalent circuit shown in Fig. 3, calculate the current gain A_i and the voltage gain A_v.

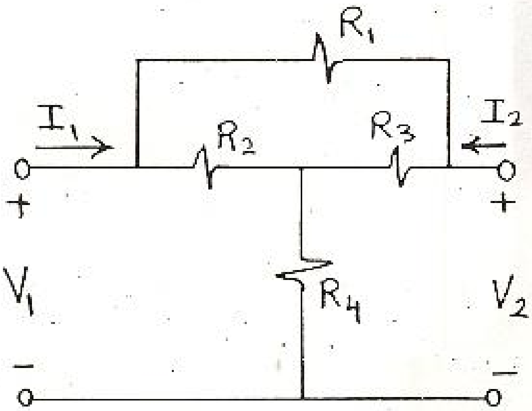


Fig.1

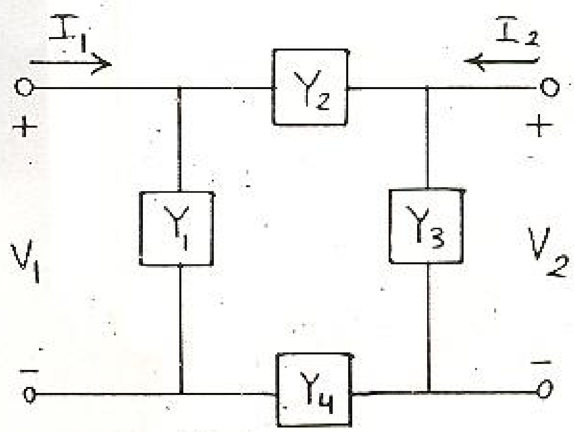


Fig.2

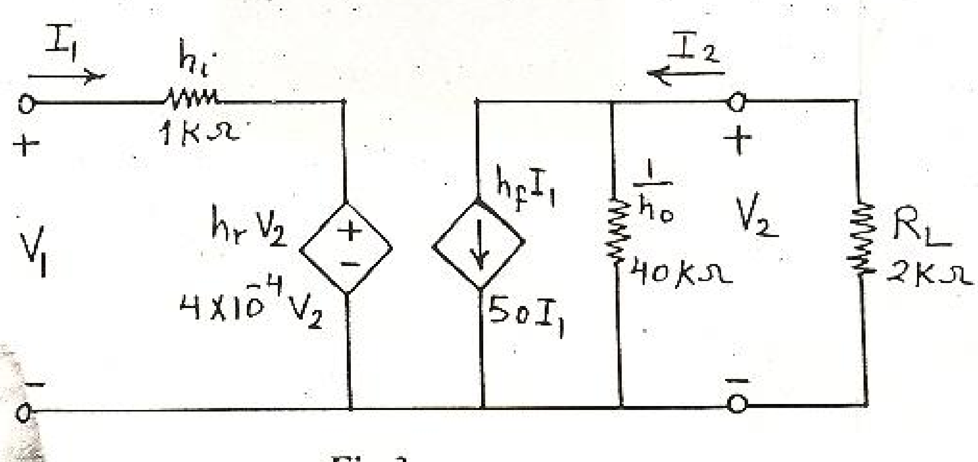


Fig.3

[5]For the Z – parameter equivalent circuit shown in Fig. 4 , calculate the input and output impedances .

[6]The Hybrid H – parameters of a network are given by : h_{11} = 1 KΩ, h_{12} = 0.0002 , h_{21} = 100 and h_{22} = 20 µ mho . Calculate the H – parameters of two of such network connected in : a) series . b) parallel . .

[7]Determine the transmission – parameters for the network shown in Fig. 5 and write its 2 – port equations in the A – form .

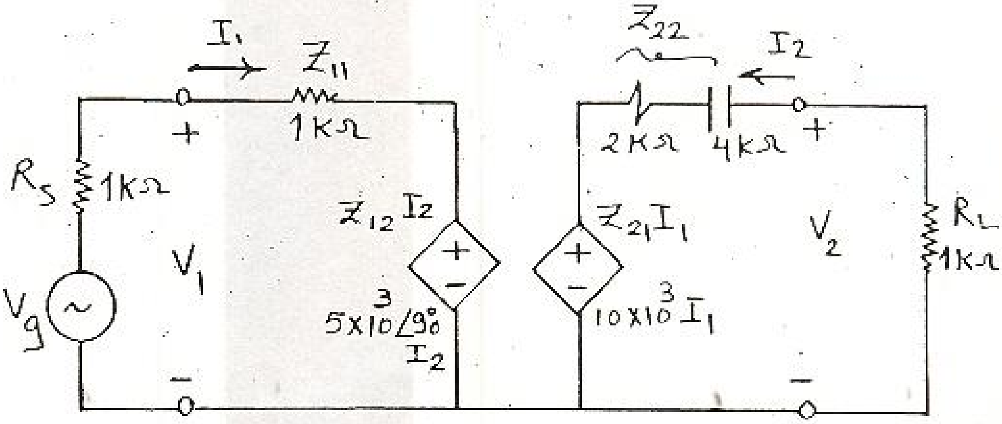


Fig.4

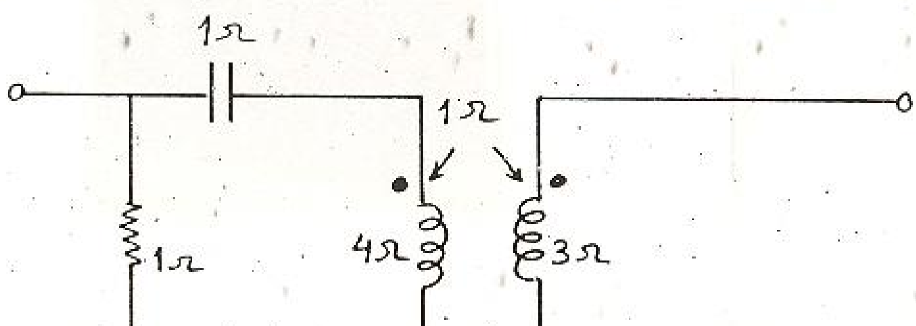


Fig.5

[8] Find the Z – parameters for the 2 – port network shown in Fig. 6 and calculate the voltage gain of the entire circuit with a 4 KΩ load attached to the output.

[9] Find the transmission – parameters for the 2 – port network shown in Fig. 7.

[10] Simplify the network shown in Fig. 8 into two 2 – port networks connected in parallel. Hence, calculate the Y – parameters' matrix of the whole network.

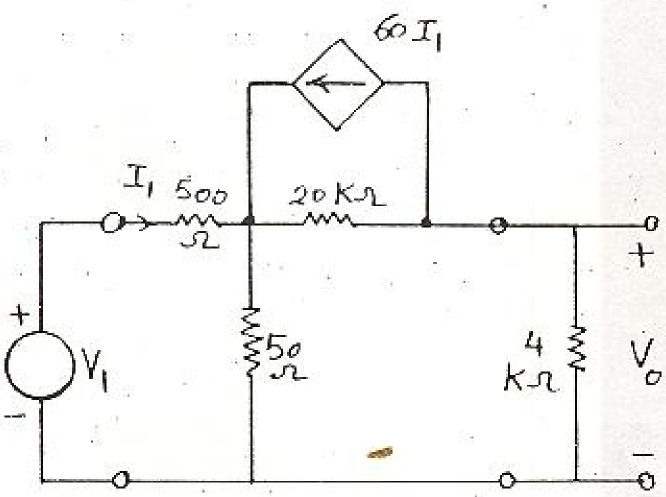


Fig.6

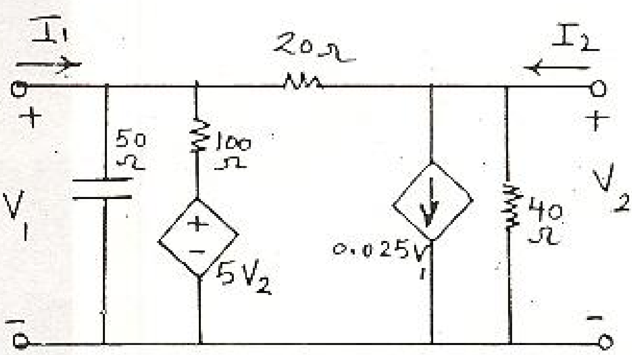


Fig.7

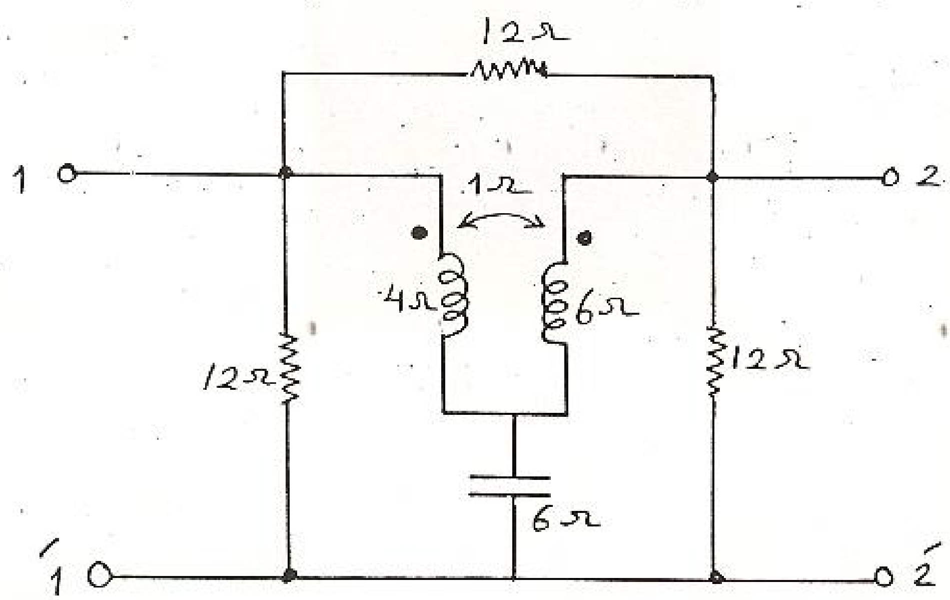


Fig.8

[11] Using the Z – parameters find Thevenin's equivalent circuit with respect to port 2 for the 2 – port network shown in Fig. 9 .

[12] The networks D and E in the circuit shown in Fig. 10 are reciprocal and symmetrical networks . D has $a_{11} = 5$ and $a_{12} = 24\ \Omega$. The impedance Z_o is adjusted for maximum average power transfer . Find Z_o if $Z_g = 5\ \Omega$.

[13] a) Derive an expression of the input and output impedances of the two-port network shown in Fig.11 in terms of the H-parameters of the network ,the internal impedance of the source Z_g and the load impedance Z_L .

b) If $h_{11} = 1500\ \Omega$, $h_{12} = 10^{-3}$, $h_{21} = 50$; $h_{22} = 50\mu$ mho , the internal impedance of the source is $Zg = 1500\Omega$ and the source voltage $V_g = 250\angle 0°$, calculate :

i) The maximum average power delivered to the load .

ii) The average power delivered to the input port of the network at the condition of maximum power transfer to the load .

Fig.9

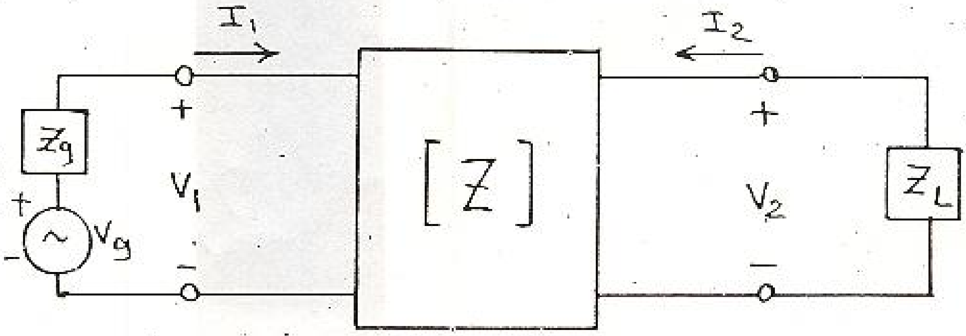


Fig.10

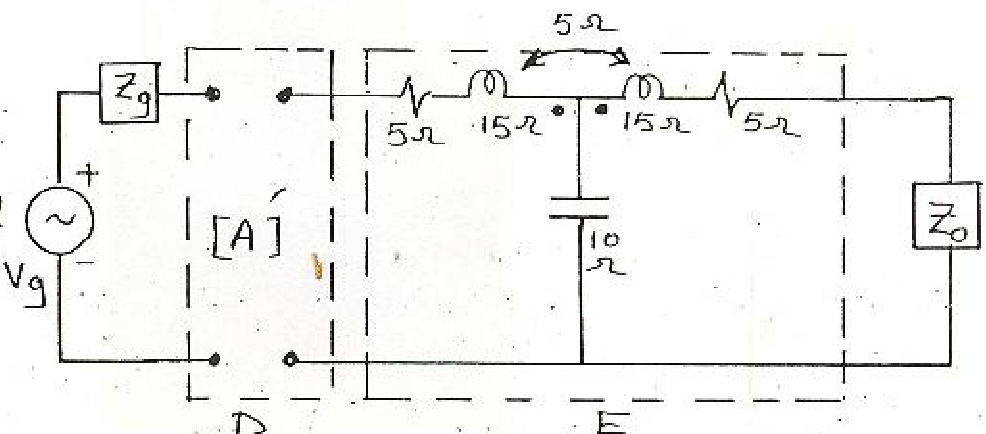
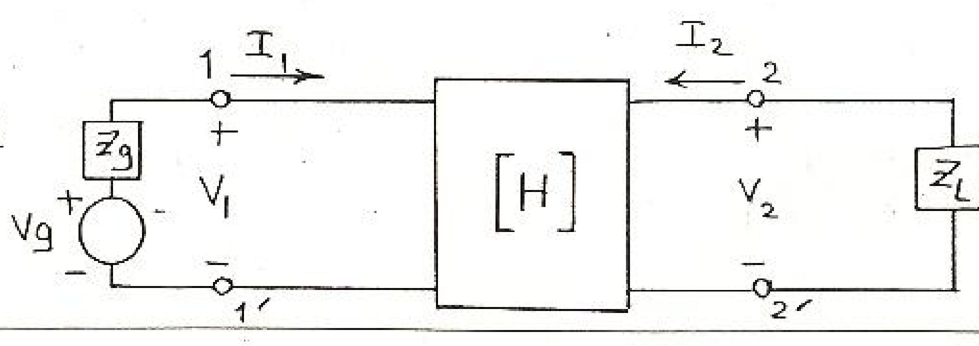


Fig.11



[14]The H-parameters of a two-port network are given by the matrix :

$$[H] = \begin{bmatrix} 2\ \Omega & 0.2 \\ -4 & 0.1\ mho \end{bmatrix}$$

a)Check the conditions of symmetry and reciprocity for the network .

b)Sketch its equivalent circuit .

c)If two resistors of 2Ω and 5Ω are added to the network as shown in Fig.12 , calculate the H-parameters of the total network :

[15]a)Calculate the transmission A-parameters of a two-port network as a function of its Hybrid H-parameters .

b)The amplifier circuit shown in Fig.13 is formed of two identical stages each having the Hybrid H-parameters given by :

$$[H] = \begin{bmatrix} 1\ K\Omega & 0.001 \\ 100 & 0.1\ m.mho \end{bmatrix}$$

What is the value of the input voltage V_s required to obtain an output voltage V_o of 25 volts ?

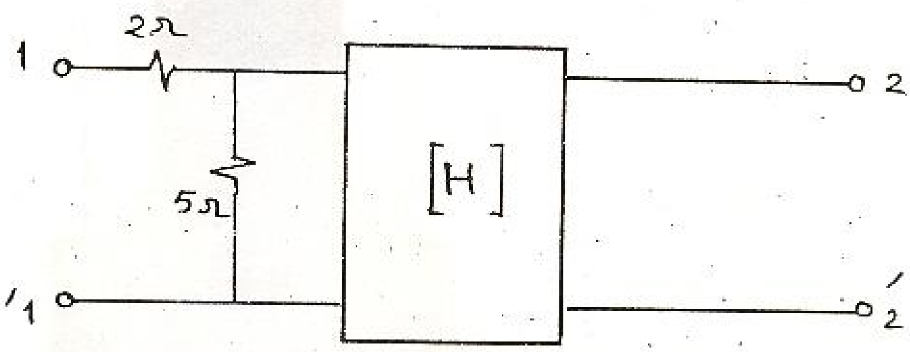


Fig.12

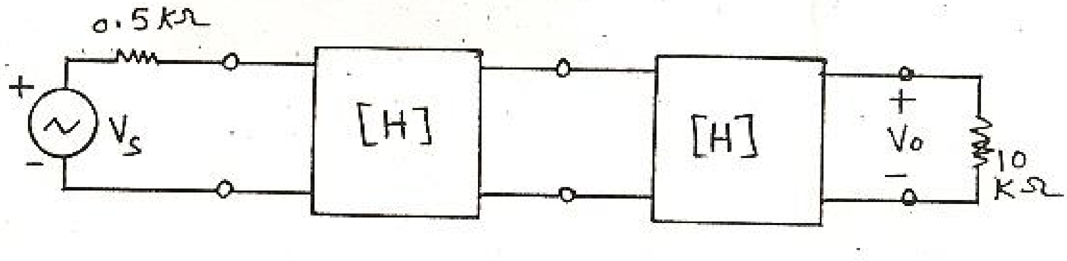


Fig.13

[16](a) Two sets of measurements were made on the two-port network N shown in Fig.14. The results were as follows :

Measurement 1	**Measurement 2**
$V_1 = 20\ mV$	$V_1 = 4\ V$
$I_1 = 20\ \mu A$	$I_1 = 5mA$
$V_2 = 40\ V$	$V_2 = 0$
$I_2 = 0$	$I_2 = -200\ mA$

Find the H-parameters representing the two-port network.

b) Using the H-parameters, calculate the value of the variable resistance R_o when adjusted to receive maximum power and find the value of this power.

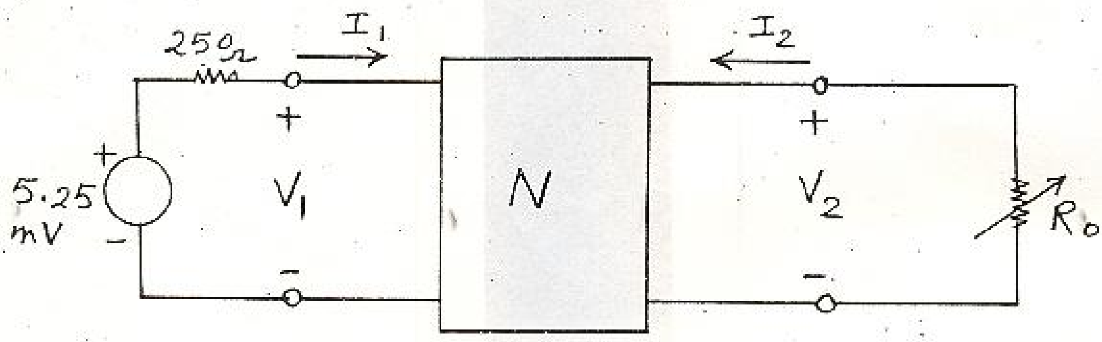


Fig.14