A/H/P NAS ASSIGNMENT – UNIT 4
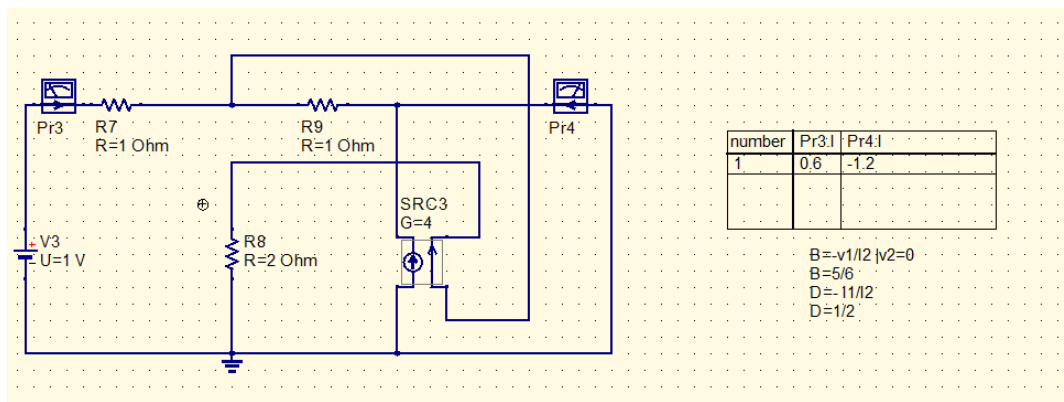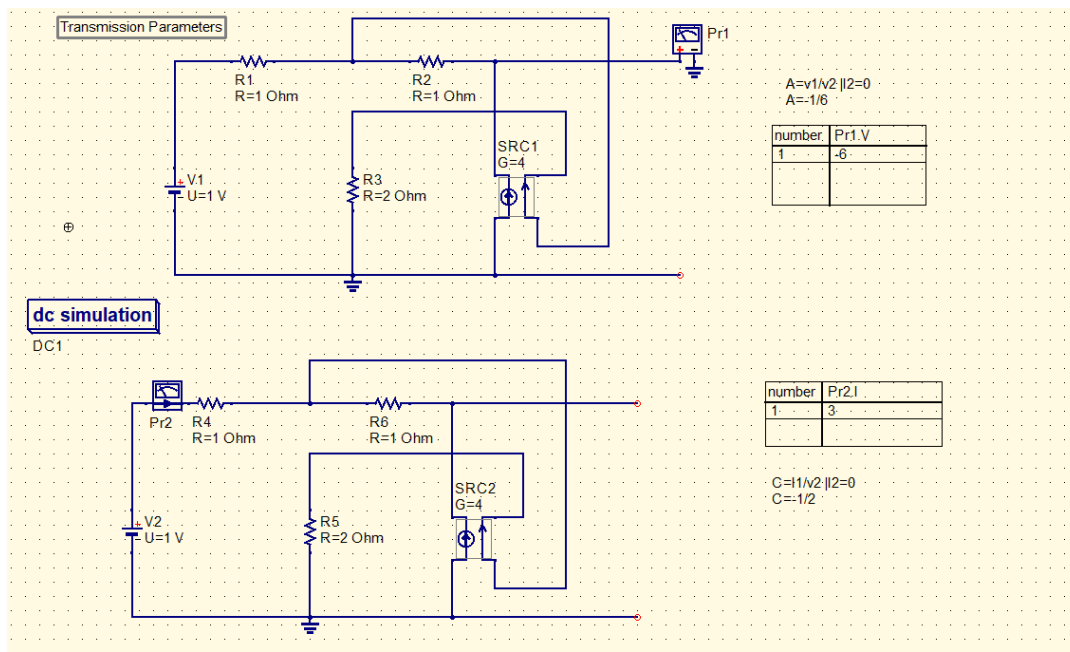
<u>NAME:</u> SOUMYADIPTO DE

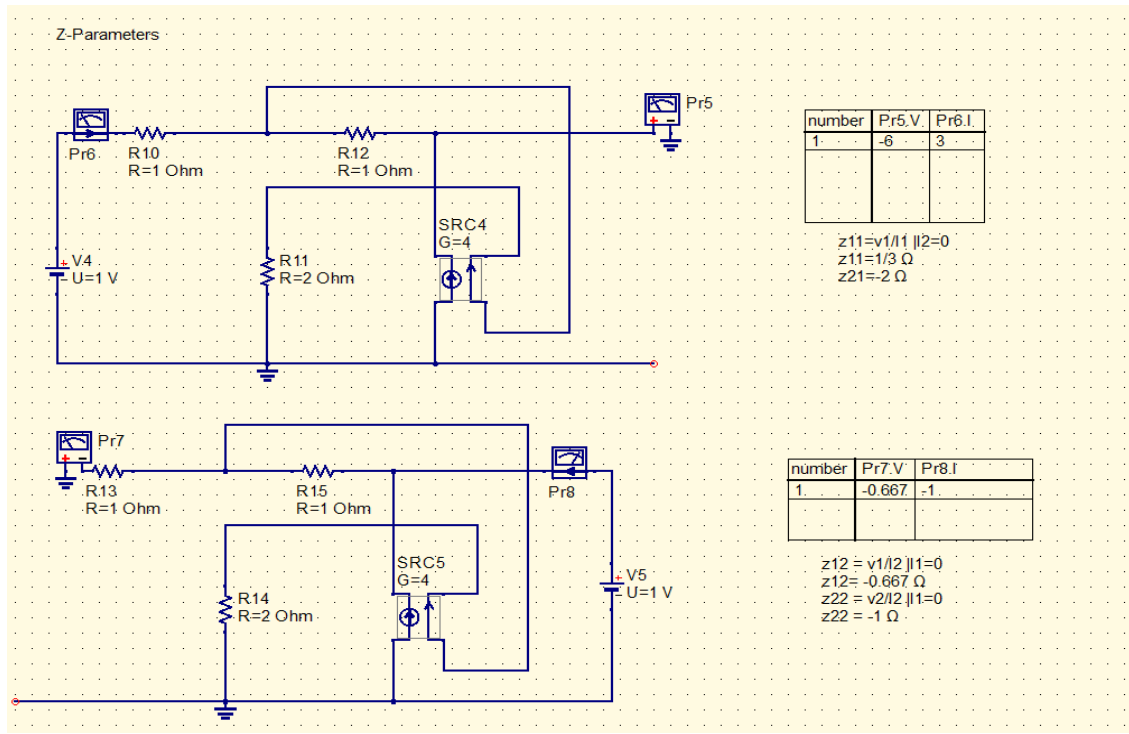<u>SRN:</u> PES1UG21EC288
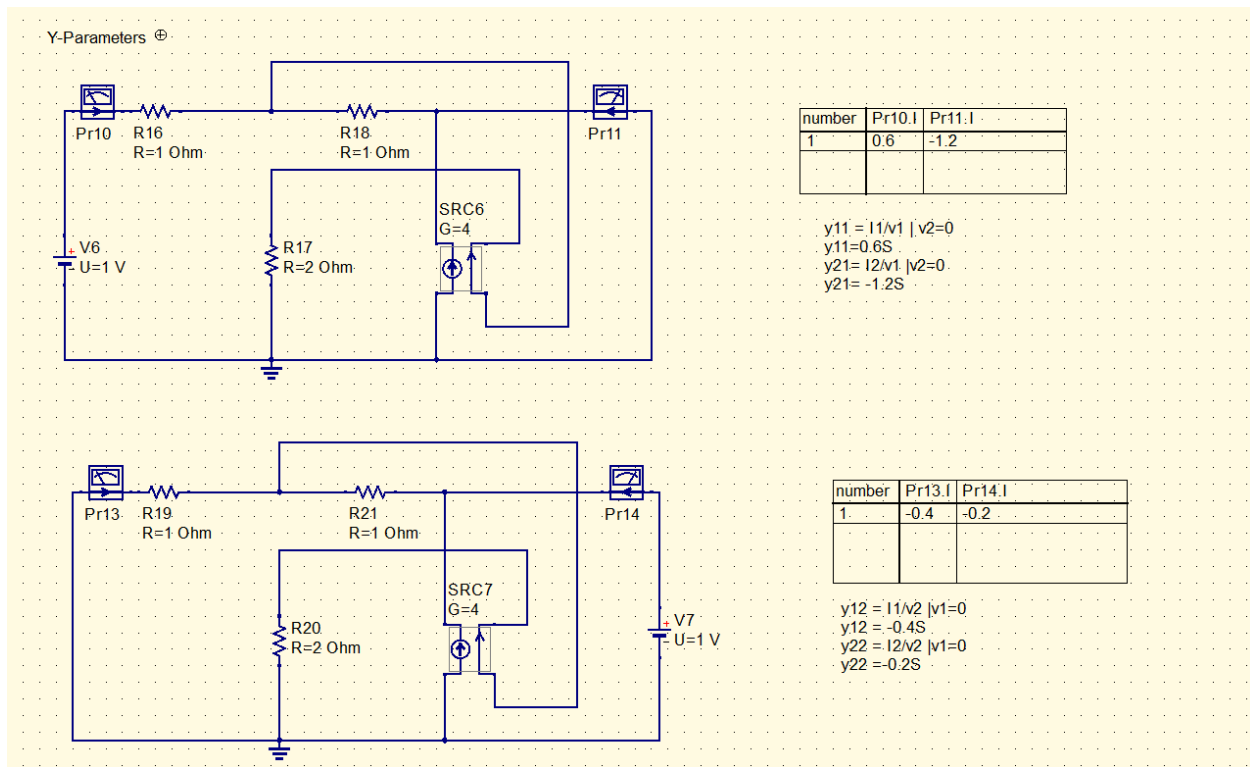
2ND YEAR, SEMESTER -3

<u>SECTION:</u> F

TRANSMISSION PARAMETERS:

Z-PARAMETERS:

Z-Parameters

number	Pr5.V	Pr6.I
1	-6	3

z11=v1/I1 |I2=0
z11=1/3 Ω
z21=-2 Ω

R10 R=1 Ohm
R12 R=1 Ohm
V4 U=1 V
R11 R=2 Ohm
SRC4 G=4
Pr6
Pr5

number	Pr7.V	Pr8.I
1	-0.667	-1

z12 = v1/I2 |I1=0
z12= -0.667 Ω
z22 = v2/I2 |I1=0
z22 = -1 Ω

R13 R=1 Ohm
R15 R=1 Ohm
R14 R=2 Ohm
SRC5 G=4
V5 U=1 V
Pr7
Pr8

Y PARAMETERS:

Y-Parameters ⊕

number	Pr10.I	Pr11.I
1	0.6	-1.2

y11 = I1/v1 | v2=0
y11=0.6S
y21= I2/v1 |v2=0
y21= -1.2S

R16 R=1 Ohm
R18 R=1 Ohm
V6 U=1 V
R17 R=2 Ohm
SRC6 G=4
Pr10
Pr11

number	Pr13.I	Pr14.I
1	-0.4	-0.2

y12 = I1/v2 |v1=0
y12 = -0.4S
y22 = I2/v2 |v1=0
y22 =-0.2S

R19 R=1 Ohm
R21 R=1 Ohm
R20 R=2 Ohm
SRC7 G=4
V7 U=1 V
Pr13
Pr14

HYBRID PARAMETERS:

Hybrid h -Parameters

Pr15   R22   R24   Pr16
        R=1 Ohm   R=1 Ohm

V8   SRC8
U=1 V   G=4
        R23
        R=2 Ohm

number	Pr15.I	Pr16.I
1	0.6	-1.2

h11 =v1/I1 |v2=0
h11=5/3 Ω
h21 =I2/I1 |v2=0
h21 = -2

Pr19

R25   R27   Pr18
R=1 Ohm   R=1 Ohm

             SRC9   V9
             G=4   U=1 V
R26
R=2 Ohm

number	Pr18.I	Pr19.V
1	-1	0.667

h12 =v1/v2 |I1=0
h12 = 2/3
h22 =I2/v2 |I1=0
h22 =-1S
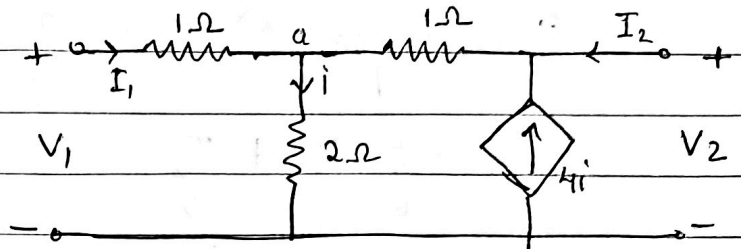
NAS - AIHIP Assignment - Unit 4

1. For the given 2 port network, find the following:
   a. Z parameters
   b. y parameters
   c. h parameters
   d. t parameters

t - parameters

$$V_1 = AV_2 - BI_2$$
$$I_1 = CV_2 - DI_2$$

$$\underline{I_2 = 0}$$

$$I_1 = \frac{V_a}{2} + \frac{V_a - V_2}{1} \quad \text{①}$$

$$\frac{V_a - V_1}{1} + \frac{V_a}{2} + \frac{V_a - V_2}{1} = 0$$

$$i = \frac{V_a}{2}$$

$$\frac{V_2 - V_a}{1} = 4\left(\frac{V_a}{2}\right) + I_2 \quad \Rightarrow \quad 0 = V_2 - 3V_a \Rightarrow V_a = V_2/3 \quad \text{②}$$

$$I_1 = \frac{V_2}{6} - \frac{2}{3}V_2 \quad \longrightarrow \quad \boxed{C = \frac{I_1}{V_2} = \frac{-1}{2} S}$$

$$I_1 = \frac{V_1 - V_a}{1} = V_1 - \frac{V_2}{3} = -\frac{1}{2}V_2$$

$$\boxed{A = -\frac{1}{6}}$$

$$\underline{V_2 = 0}$$

$$\frac{V_a - V_1}{1} + \frac{V_a}{2} + \frac{V_a - 0}{1} = 0 \quad \Rightarrow \quad V_1 = \frac{5}{2}V_a \quad \text{③}$$

$$I_2 \neq 2V_a = \frac{0 - V_a}{1} \quad \Rightarrow \quad I_2 = -3V_a \quad \Rightarrow \quad V_a = -\frac{I_2}{3}$$

$$I_2 = -3 \times \frac{2}{5} V_1 \qquad \Rightarrow \quad 5 I_2 = -6 V_1$$

$$B = -\frac{V_1}{I_2} = \frac{-5}{6}\,\Omega \;\rightarrow\; \boxed{B = \frac{5}{6}}$$

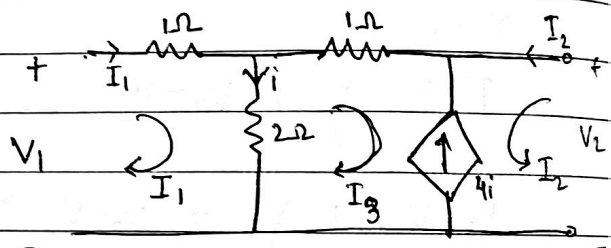$$I_1 = \frac{V_1 - V_a}{1} \;;\; ^{A'} \; V_a = -\frac{I_2}{3}$$

$$I_1 = -\frac{5}{6} I_2 + \frac{I_2}{3}$$

$$\boxed{\frac{-I_1}{I_2} = D = \frac{1}{2}}$$

Z parameters

$$V_1 = Z_{11} I_1 + Z_{12} I_2$$
$$V_2 = Z_{21} I_1 + Z_{22} I_2$$

$$I_3 = -4i$$

KCL

$$I_1 - I_3 \mp i = 0 \Rightarrow I_1 = -3i$$

$$V_1 = 2 I_1 - 2 I_3 \quad\underline{\quad} \quad ①$$

$$\boxed{Z_{11} = \frac{V_1}{I_1} = \frac{-i}{-3i} = \frac{1}{3}\,\Omega}$$

$$V_2 = -3 I_3 + 2 I_1 = 6i$$

$$\boxed{Z_{21} = \frac{V_2}{I_1}\Big|_{I_2=0} = \frac{6i}{-3i} = -2\,\Omega}$$

$$I_1 = 0$$
$$I_3 = -i + 4i = \cancel{+3i} \quad i - 4i = -3i$$
$$V_1 = 2i$$

$$\boxed{Z_{12} = \frac{V_1}{I_2}\Big|_{I_1=0} = \frac{2i}{\mp 3i} = -\frac{2}{3}\,\Omega}$$

$$\left[z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0} = \frac{3i}{-*3i} = -1\,\Omega \right]$$

Y parameters

short $V_2 = 0$

$$V_c = V_1 + V_c + V_c \cdot Q = 0$$

$$V_1 = \frac{5}{2} V_c \quad \text{—①}$$

$$I_2 + 2V_c = \frac{0 - V_c}{1} = 0$$

$$I_2 = -3V_c \quad \text{—②}$$

$$V_1 = \frac{5}{2} \times -\frac{1}{3} I_2 = \frac{-5}{6} I_2 \Rightarrow \left[y_{21} = \left.\frac{I_2}{V_1}\right|_{V_2=0} = \frac{-6}{5} = -1\cdot2\,S \right]$$

$$I_1 = \frac{V_1 - V_c}{1} \Rightarrow I_1 = V_1 - \frac{2}{5} V_1$$

$$\left[y_{11} = \left.\frac{I_1}{V_1}\right|_{V_2=0} = \frac{3}{5} = 0\cdot6\,S \right]$$
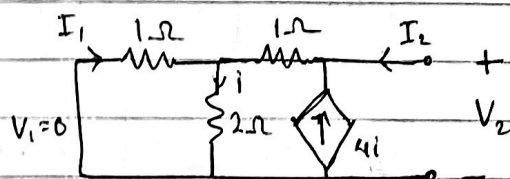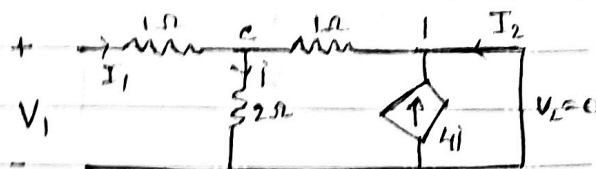
short $V_1 = 0$

$$\frac{V_c - 0}{1} + \frac{V_c}{2} + \frac{V_c - V_2}{1} = 0$$

$$\Rightarrow \quad 5V_c = 2V_2 \quad \text{—③}$$

$$\frac{V_2 - V_c}{1} - 4\left(\frac{V_c}{2}\right) = I_2 = 0 \Rightarrow V_2 - 3V_c = I_2$$

$$V_2 - 3\left(\frac{2}{5}V_2\right) = I_2 \Rightarrow \left[y_{22} = \left.\frac{I_2}{V_2}\right|_{V_1=0} = -0\cdot2\,S \right]$$

$$5(-I_1) = 2V_2 \Rightarrow \left[y_{12} = \left.\frac{I_1}{V_2}\right|_{V_1=0} = -0\cdot4\,S \right]$$
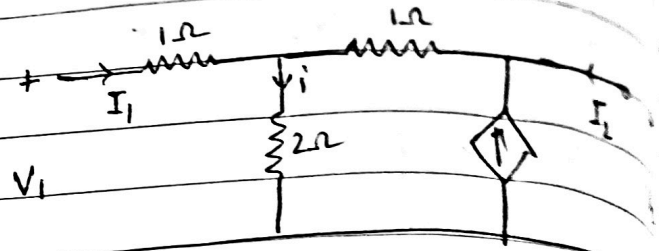
h-parameters

$I_1 = 0$

$$\frac{V_1 - V_2}{1} + \frac{V_1}{2} = 0$$

$$\boxed{h_{12} = \frac{V_1}{V_2} = \frac{2}{3}}$$

$-4i + i - I_2 = 0 \implies I_2 = -3i$

$V_2 = (1+2) \times i = 3i$

$h_{22} = \frac{I_2}{V_2}\Big|_{I_1 = 0}$

$$\boxed{h_{22} = \frac{-3i}{3i} = -1\,S}$$

$\rightarrow$ $\underline{V_2 = 0}$

$$\frac{V_x - V_1}{1} + \frac{V_x}{2} + \frac{V_x - 0}{1} = 0$$

$V_1 = \frac{5}{2}V_x \implies i = 5 \quad ; \quad i = \frac{V_x}{2}$

KCL

$I_1 = -3i$

$$\boxed{h_{11} = \left(\frac{5}{2} \times 2i\right) \div 3i = \frac{5}{3}\,\Omega}$$

$$\boxed{h_{21} = -2S} \quad \left(\because I_2 = -3V_x = 6i\right)$$