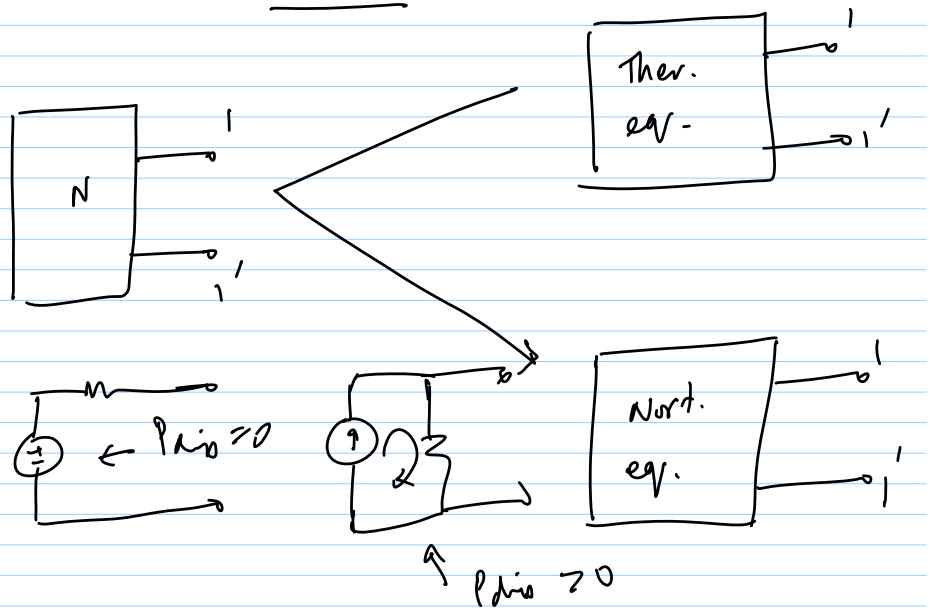
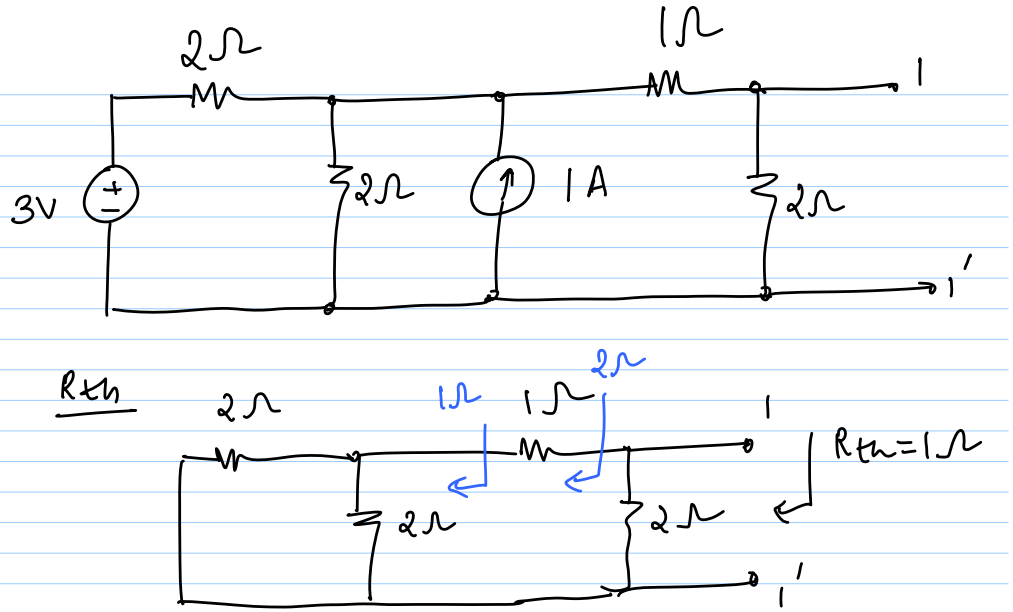
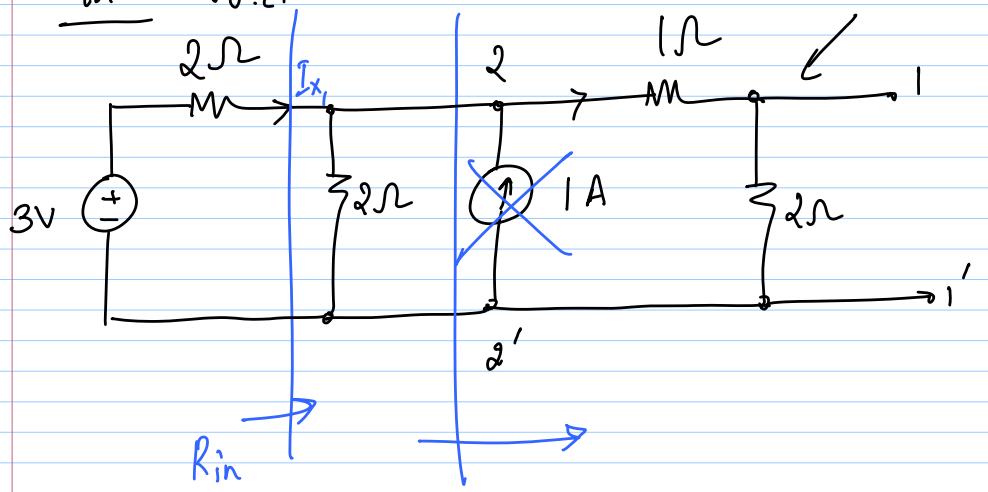
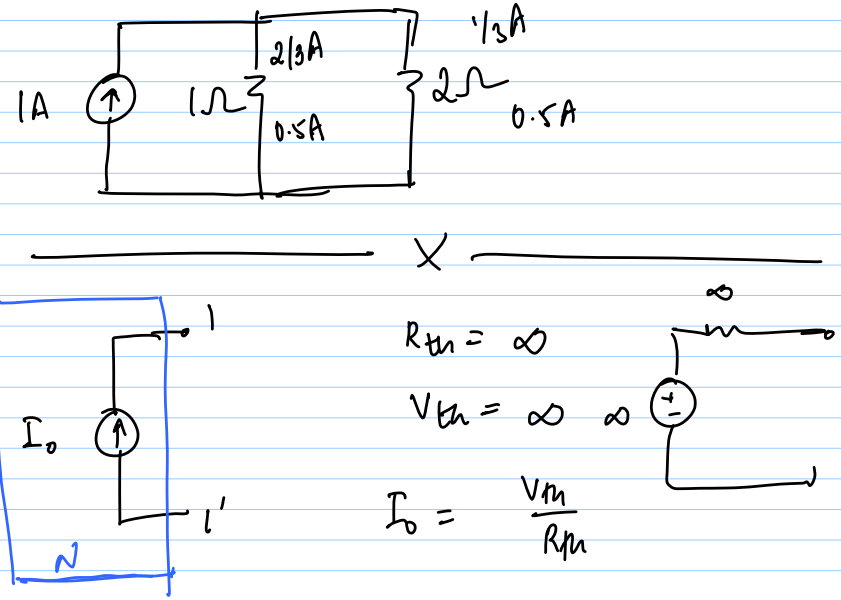
5-2-15

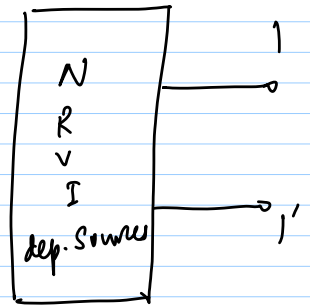
Lec 12


N
1
1'
Ther.
eq.
Norton
eq.
$P_{dis}=0$
$P_{dis}>0$
2


2Ω
1Ω
3V
2Ω
1A
2Ω
1
1'
Rth
1Ω
1Ω
2Ω
2Ω
2Ω
Rth=1Ω

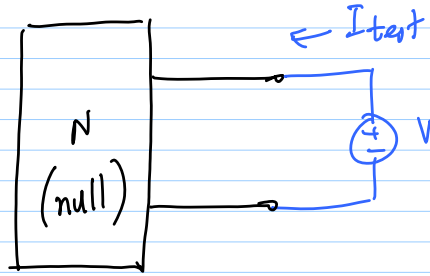

Vth : $V_{o.c.}$ = 5/4V
2Ω
I_x
2
1Ω
1
3V
2Ω
1A
2Ω
1'
2'
R_{in}


1A
1Ω
2/3A
0.5A
1/3A
2Ω
0.5A
X
I_o
1
1'
N
$R_{th}=\infty$
$V_{th}=\infty$
∞
$I_o=\frac{V_{th}}{R_{th}}$



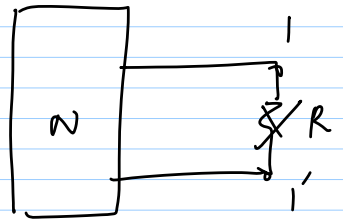
V_{th} : $V_{o.c.}$

R_{th} :

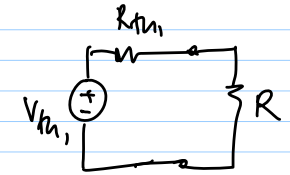


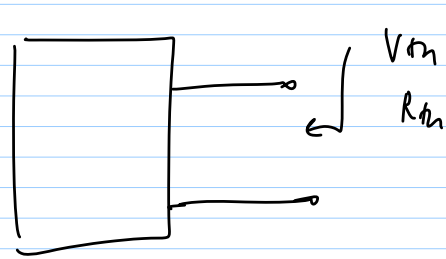
$$R_{th} = \frac{V_{test}}{I_{test}}$$

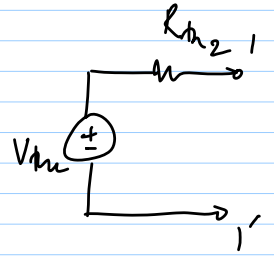
alternatively apply I_{test} & measure V_{test}



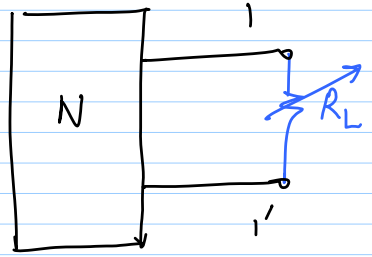
V_R or I_R





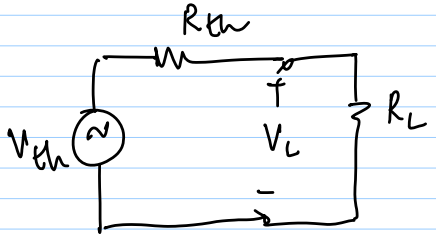


Maximum power transfer theorem



Objective : Maximise power delivered to R_L

$$P_L = V_L I_L$$



$$P_L = \frac{R_L V_{th}}{R_L + R_{th}} \cdot \frac{V_{th}}{R_L + R_{th}}$$

$$= V_{th}^2 \cdot \frac{R_L}{(R_L + R_{th})^2}$$

$$= \frac{V_{th}^2}{R_{th}} \cdot \frac{R_L}{\left(\frac{R_L}{\sqrt{R_{th}}} + \sqrt{R_{th}}\right)^2}$$

$$= \frac{V_{th}^2}{R_{th}} \cdot \frac{1}{\left(\sqrt{\frac{R_L}{R_{th}}} + \sqrt{\frac{R_{th}}{R_L}}\right)^2}$$

$R_L = R_{th}$

$\boxed{R_L = R_{th}}$ gives maximum P_L