Final Project

Department of Computer Science and Engineering

Course Code: CSE 209
Section: 2
Course Title: Electrical Circuit.

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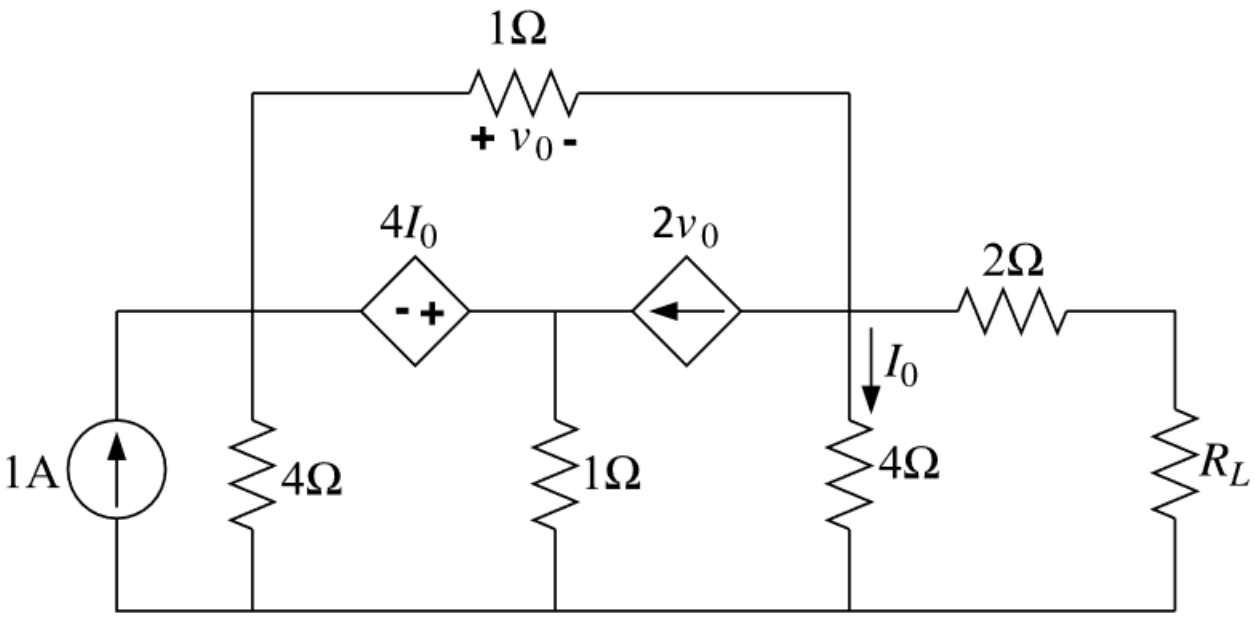
Tittle: PSpice Analysis for Maximum Power Transfer.

Q 1. Using PSpice Simulation, determine the Thevenin's equivalent of the circuit looking from the load resistance R_L .

ANS: the original circuit given on the question is



From the PSpice simulation we can see

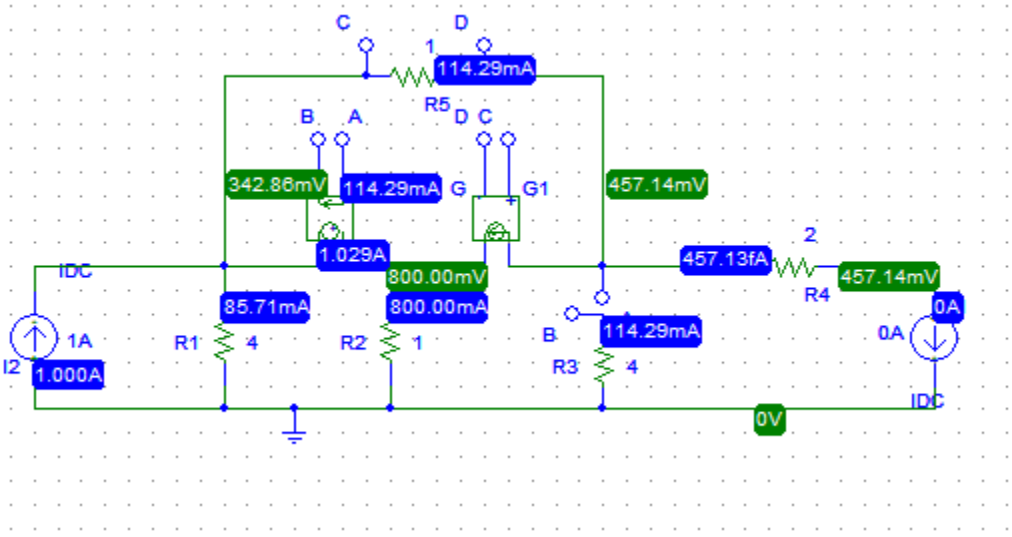


Figure 2

From the figure 2 we find V_{oc}=0.457V

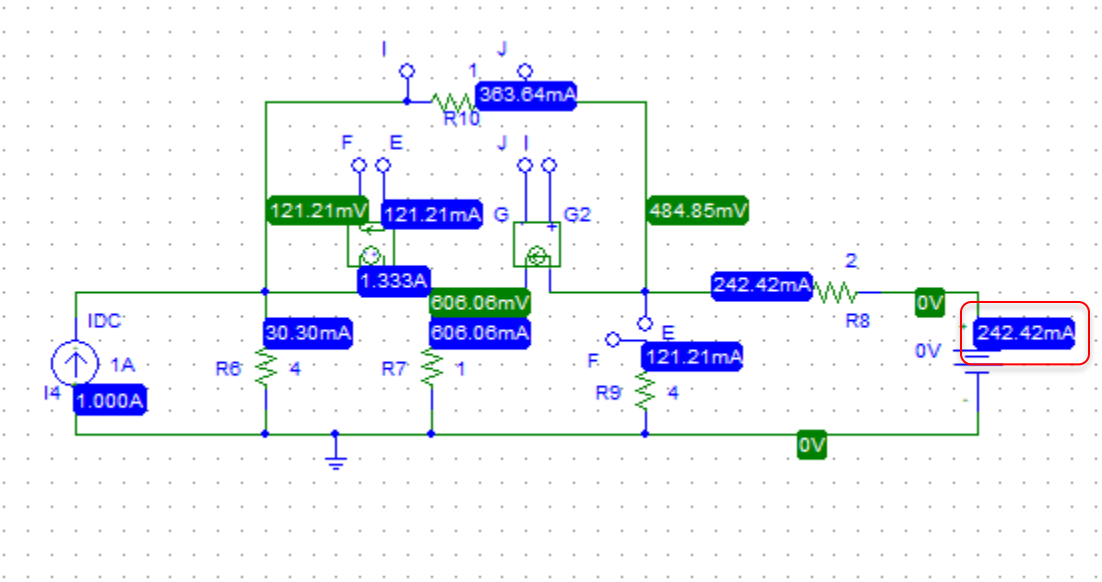
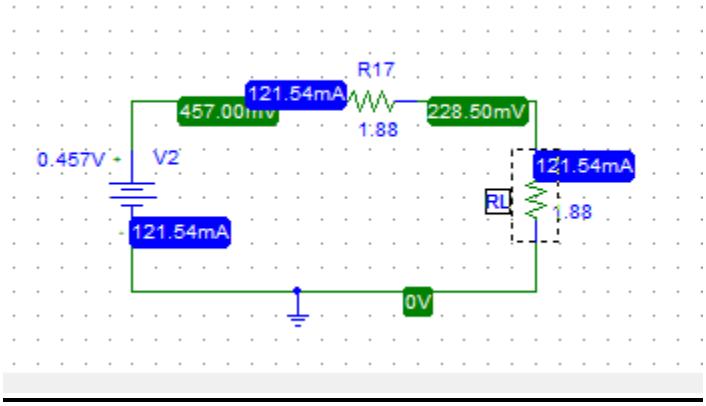


Figure 3

From the figure 2 we find I_{sc}= 242.42mA



$R_{th} = R_L = V_{oc}/I_{sc}$

$R_{th} = 0.457/242.42m$

$R_{th} = 1.88\ \Omega$

Q 2. From the Thevenin's equivalent circuit, theoretically determine the value of load resistance R L for maximum power transfer. Using PSpice Simulation of the Thevenin's equivalent circuit with R L for maximum power transfer, determine the value of maximum power transferred to R L?

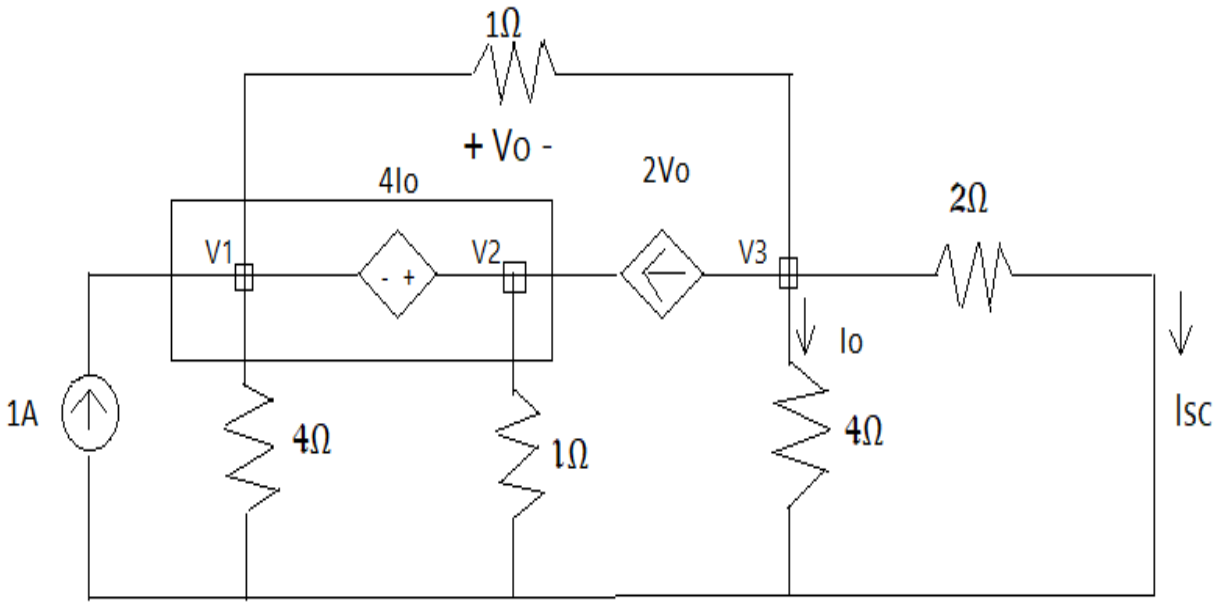


Figure 5

Applying KCL at Super Node,

$-1+(V_1/4)+(V_1-V_3)/1+(V_2/1)-2(V_1-V_3)=0$

or, $-3/4\ V_1 + V_2 + V_3 = 1$……..(1)

Applying KCL at 3,

$V_3 - V_1 + 2(V_1 - V_3) + V_3 / 4 + V_3 / 2 = 0$

or, $V_1 - 1/4\ V_3 = 0$……(2)

From the super node ,

$V_2-V_1= 4I_0$ $[I_0=V_3/4]$

or,$- V_1 + V_2 - V_3 = 0$……(3)

After calculation from equation 1,2 and 3

V_3 =0.48484V

So, I_{sc} = V_3 /2

I_{sc} = 0.4848/2

I_{sc} =0.24242A

Now,

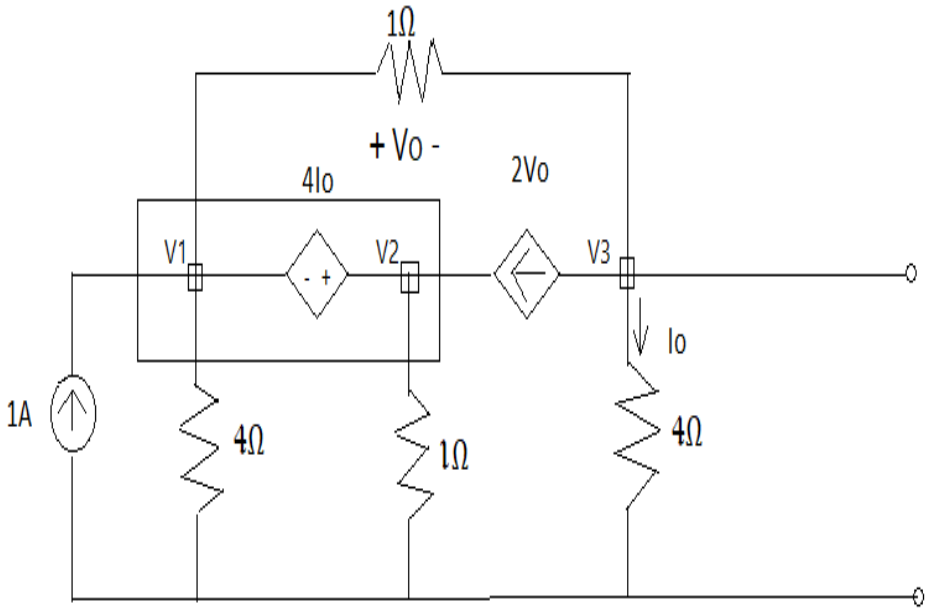


Figure 6

Applying **KCL** at super node respectively,

$-1+(V_1/4)+V_1-V_3+V_2-2(V_1-V_3)=0$

or,$(-3/4\ V_1)+V_2+V_3=1$……..(1)

Applying **KCL** at node 3 respectively,

$V_3-V_1+2(V_1-V_3)+V_3/4=0$

or, $V_1-(3/4\ V_3)=0$ ……..…(2)

From super node ,

$V_2-V_1=4*V_3/4$

or, $- V_1 + V_2 - V_3 = 0$ ……(3)

From equation (1), (2) ,And (3)

$V_3 = 16/35 = 0.457V$

$V_3 = V_{oc} = V_{th} = 0.457V$

$R_{th} = R_L = V_{oc}/I_{sc}$

$R_{th} = 0.457/0.24242$

$R_{th} = 1.88\ \Omega$

$P_{max} = V_{th}^2 / 4R_{th}$

$P_{max} = (0.457)^2 / 4 * 1.88$

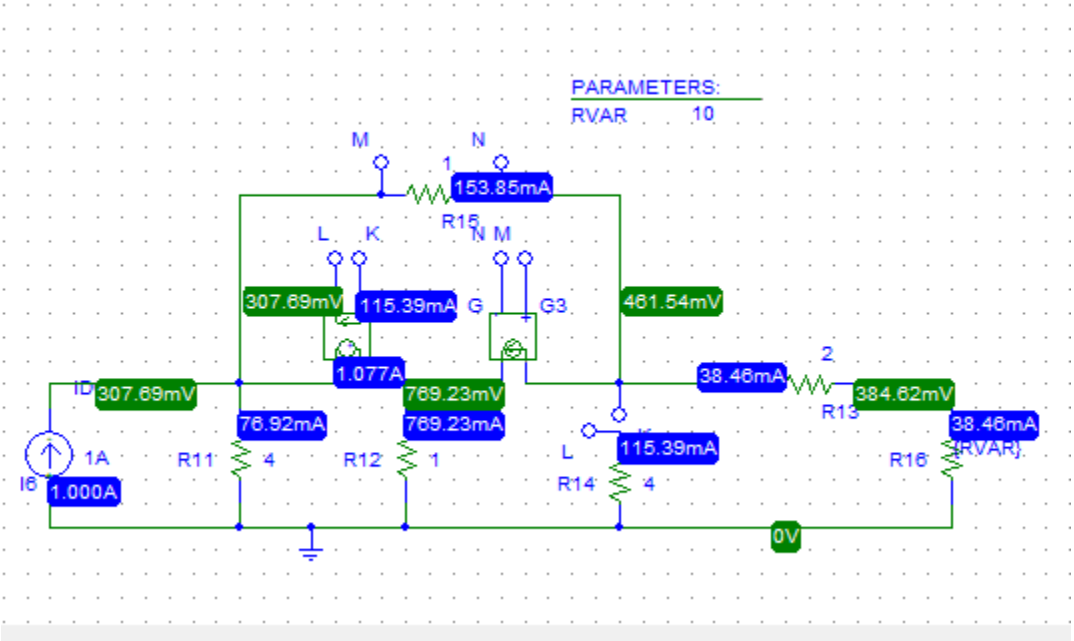
$P_{max} = 0.0277W$

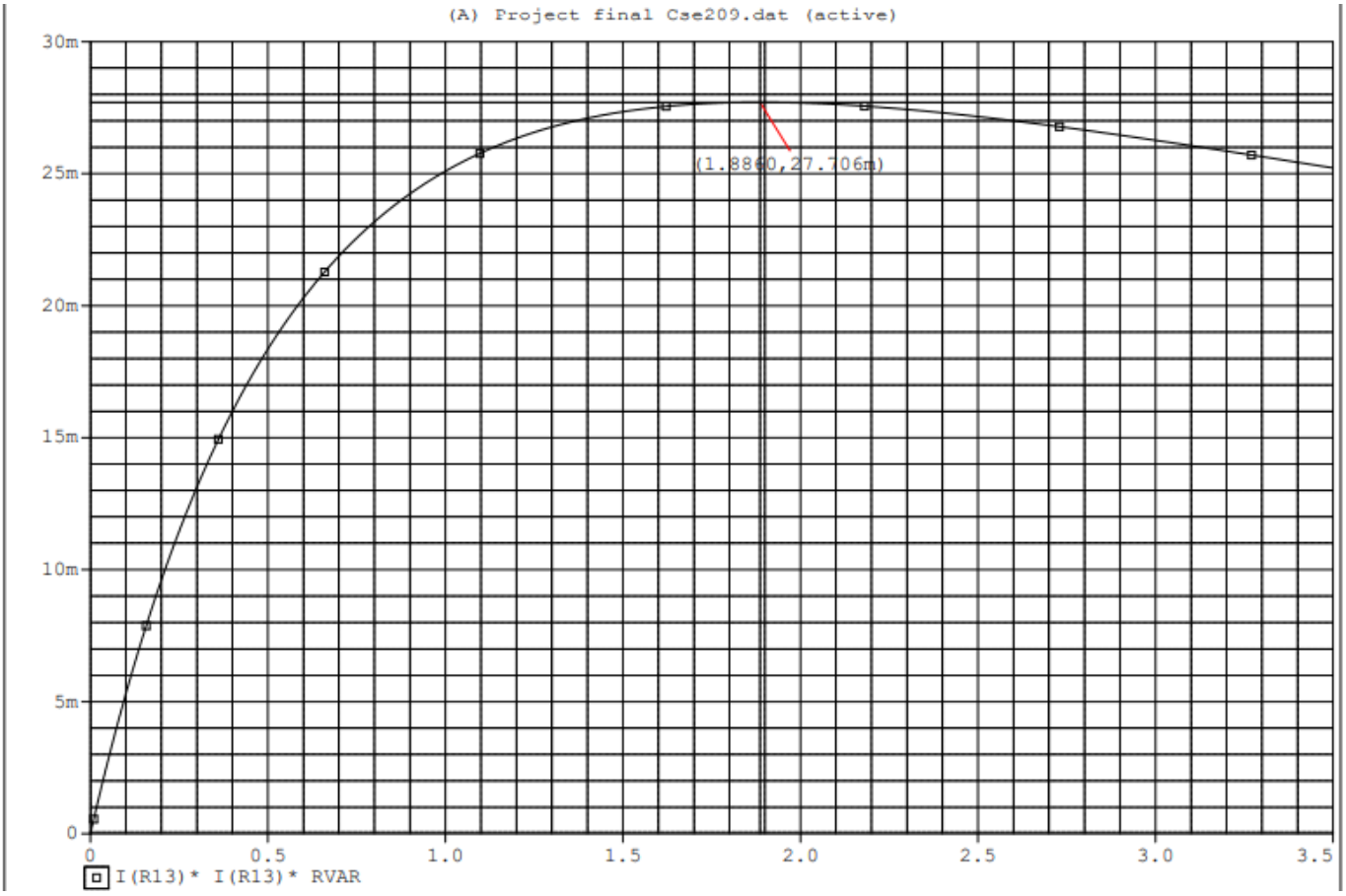
OR, $P_{max} = 0.0277W$

So, $P_{max} = 0.028W$

Q 3. Using PSpice Simulation with resistance sweep, determine the value of R L for maximum power transfer and the corresponding maximum power.

ANS:





From the graph max power is 27.706mw =0.27706W.

Q4. Compare the value of R L and maximum power obtained in steps 2 and 3.
ANS: from the table we can see there is no difference between theoretically calculation and PSpice simulation

	STEP 2	**STEP 3**
$\mathbf{R_L}$	1.88 Ω	1.88 Ω
$\mathbf{P_{max}}$	0.028W	0.0277W =0.028W