Suppers position theorem

نظرية التركب أو التطابق

Aim of lecture : To let the student be able to identify the analyses net worke by using Suppers position theorem

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B –Rationale مبررات الوحدة

- It is very important to study Suppers position theorem

C – Central الفكرة المركزية Idea

- Definition Suppers position theorem
- To calculate the lowed current flows from each source and to find the result from the total currents.

Pretest ألاختبار القبلي

Define : Current load (IL) ,draw Norton equivalent

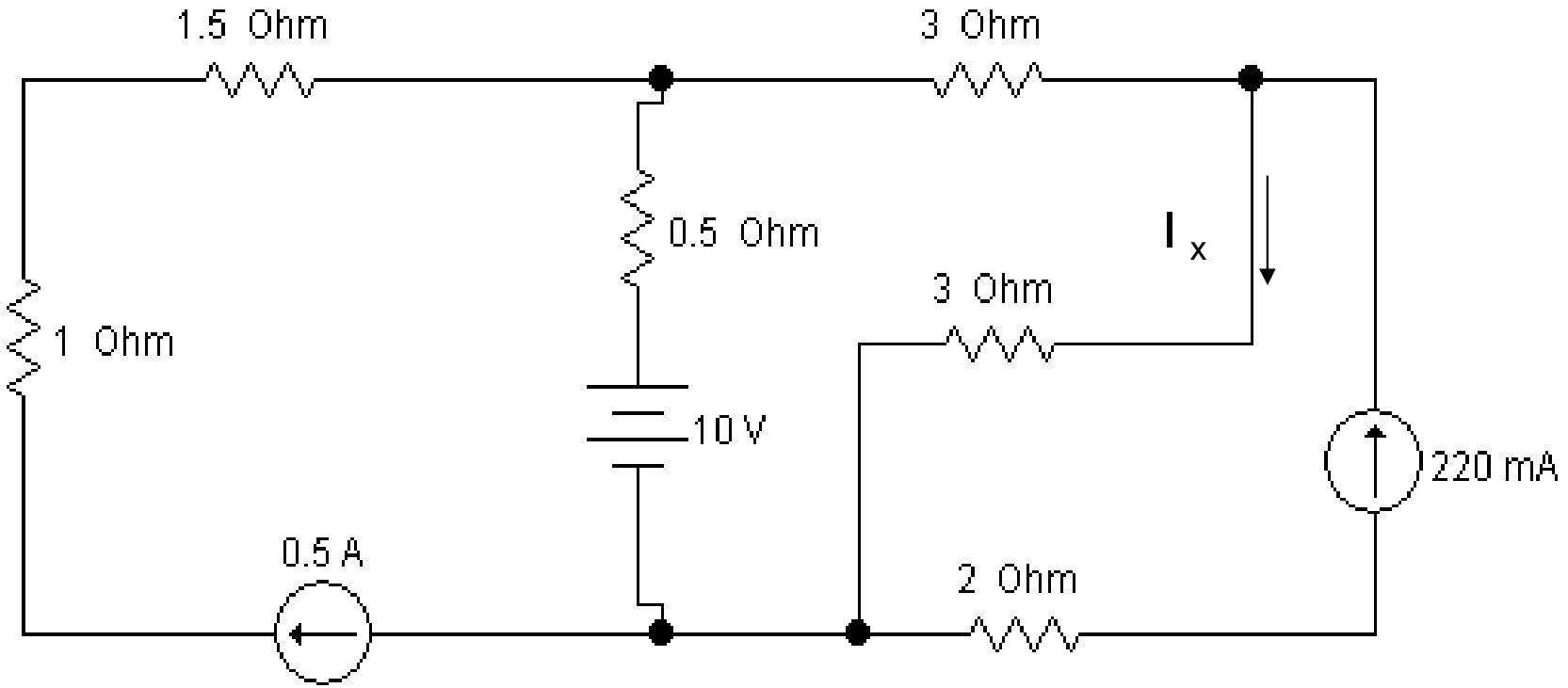
Solution

هو التيار المار خلال مقاومة الحمل المراد حساب تيارها (تيار الحمل)

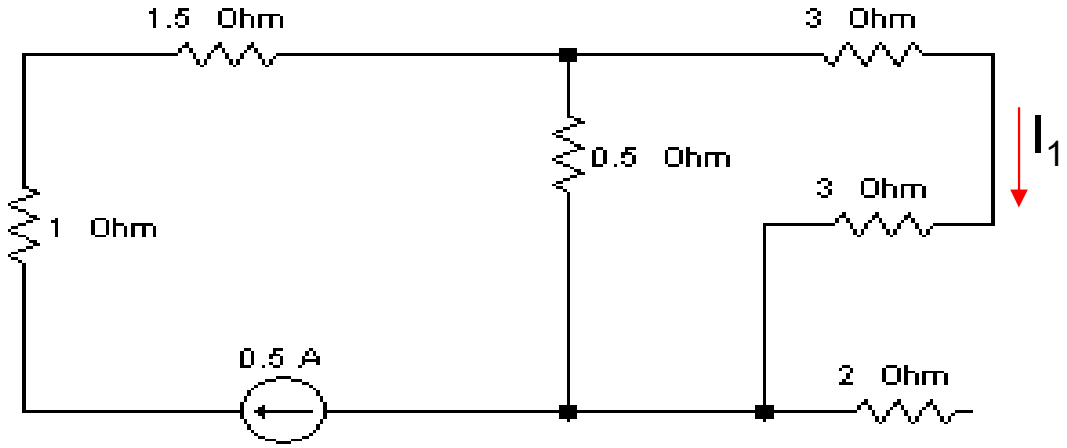
IL:

$$I_L = I_n \times R_N / (R_N + R_L)$$

Ex. For the cct. Shown using supper position theorem to find (I_x)

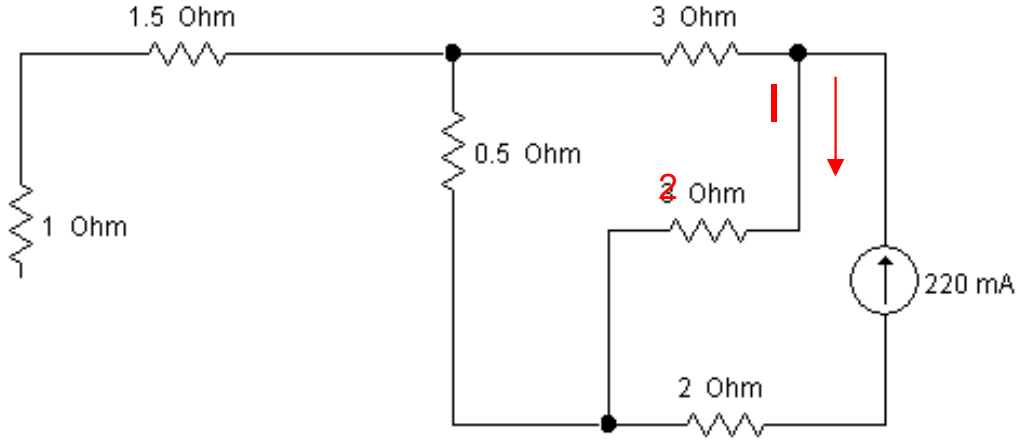


Solution:- 1- Effect of 0.5A only



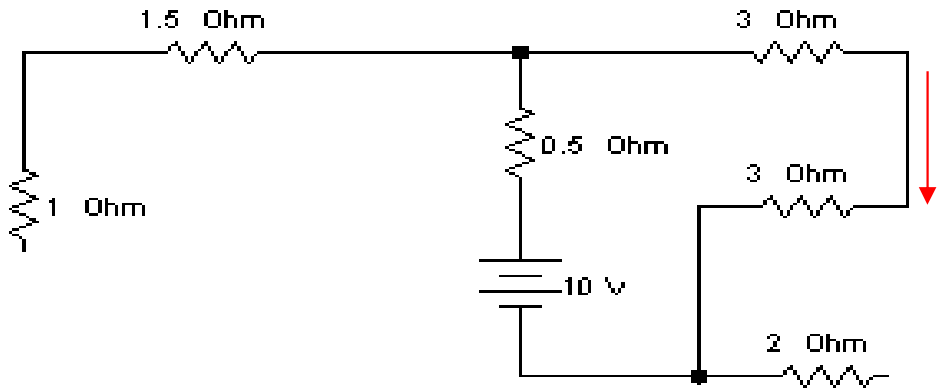
I_1= 0.5x(0.5)/ 0.5+(3+3)=0.038 A ↓

2- Effect of 220mA only



I_2=0.22x(3+0.5)/3.5+3=0.118A ↓

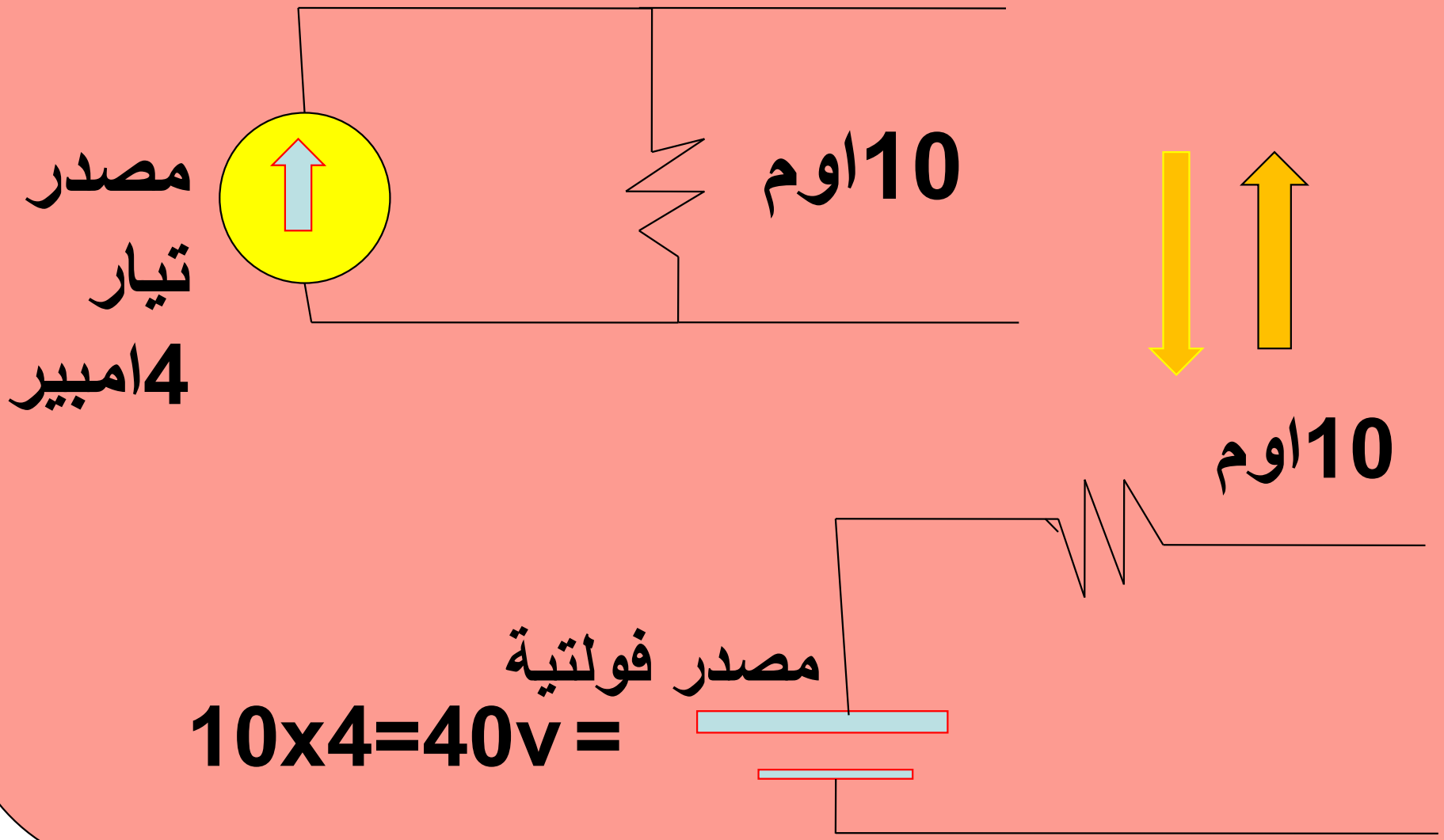
3- Effect of 10v only



I_3=10/(0.5+3+3)=1.538A ↓

Then $I_x = I_1 + I_2 + I_3 = 1.694A$ ↓

كيفية تحويل مصدر التيار إلى مصدر فولتيه وبالعكس



Note

Maximum power transfer

- انتقال أعظم قدرة

When $R_L=R_{in}$ there is $P_{maximum}$ transfer to the load

$R_L=R_{in}$

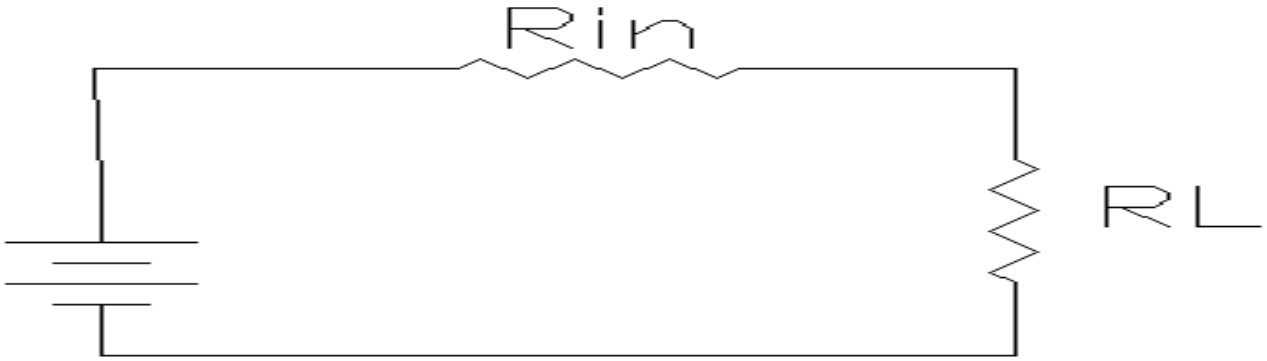
$I_L=V/(R_{in}+R_L)=V/2R_{in}$ But $P=I^2.R$

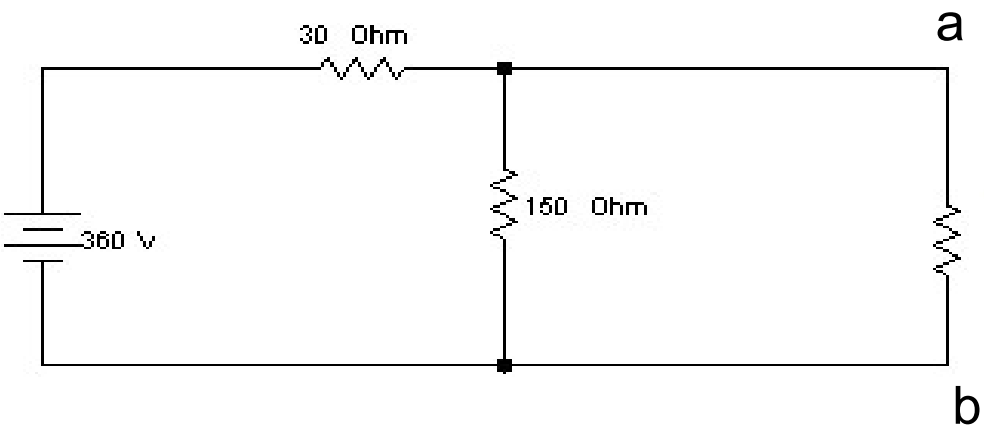
$P_{max.}=I_L^2 .R_L$

$P=(V/2R_L)^2 \times R_L = V^2 \times 4R_L$

Then ; at Thevinins equivalent

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

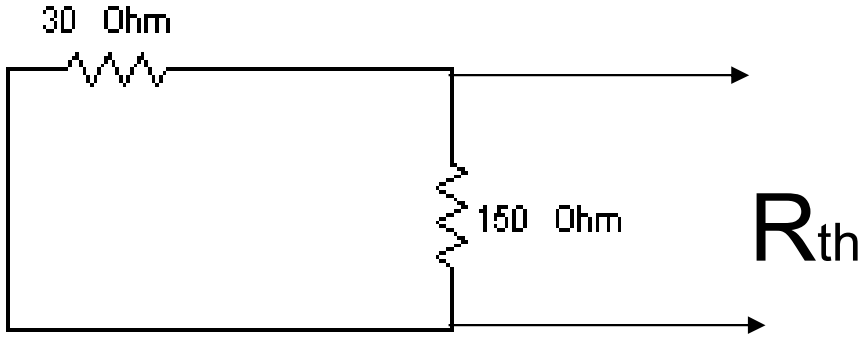




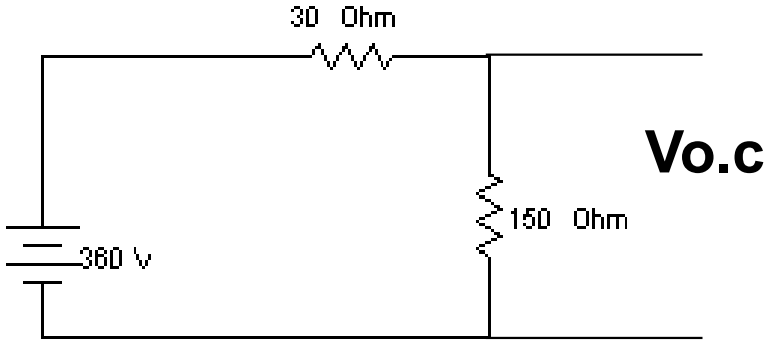
Ex. : ***Find*** R_L for max. p . T and calculate P_{max}.

Solution

$R_L = R_{th}$ then



R_{th}= (30x150)/30+150 = 25 ohm =R_L



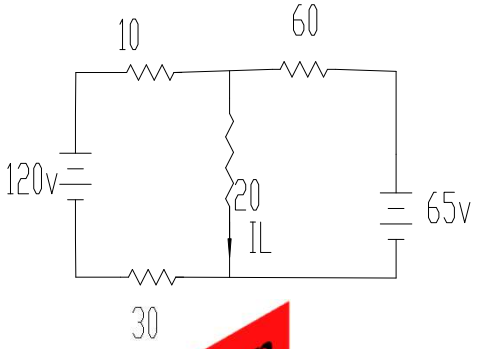
Vo.c=150 x 360 /(30+150)= 300v

$P_{max} = Vo.c^2 / 4 R_{th}$ =

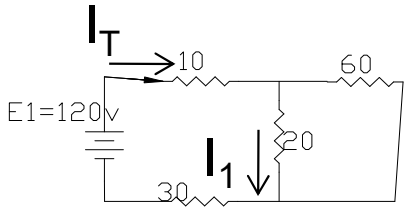
$(300)^2/(4x25)$= 900 watt

Posttest ألاختبار ألبعدي

For the cct. Shown find IL
by using supper position
em



Solution

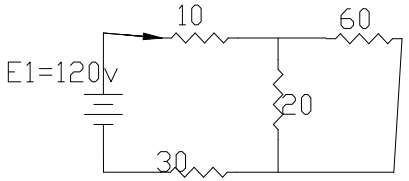


(I_1)

$E_1=120v$, $E2=0$, $R_T=(60//20)+10+30=(20x60)/80+40=55\Omega$

$I_T=120/55=2.182A$,

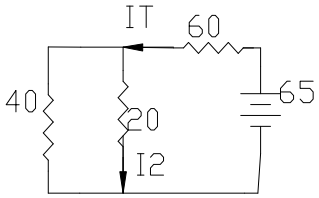
$\therefore I_1=60/(60+20)x2.182=1.64A$



(2)

$E_1=0$, $E_2=65v$, $R_T=[(10+30)//20]+60$

$=(40x20)/60+60=73\Omega$



$I_T=65/73=0.89A$, $\therefore I_2=40/(40+20)\ x0.89=0.59A$

$\therefore I_L=I_1+I_2=1.64+0.59=2.23A\ \downarrow$