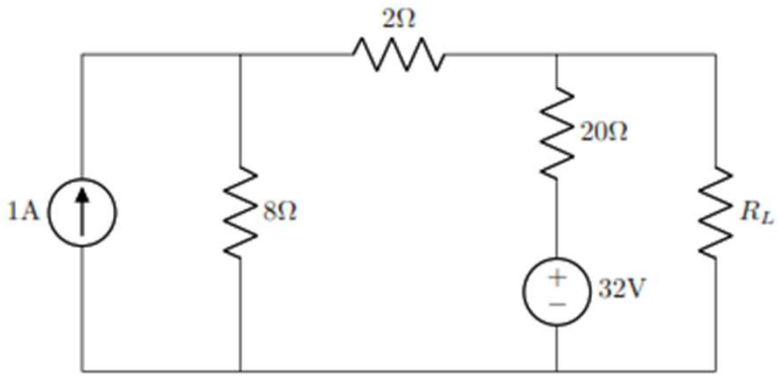
SUPERPOSITION THEOREM

(INDEPENDENT SOURCES)

The response of a network with several independent sources can be obtained as the sum of responses to sources taken one at a time as a consequence of circuit linearity.

Problem-21:

For the given circuit determine the current through $R_L = 20\ \Omega$ by using the superposition theorem.

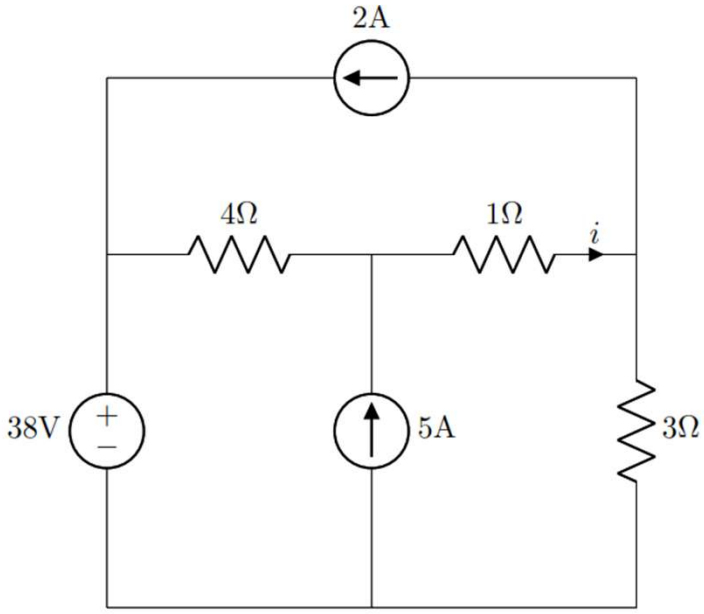


SUPERPOSITION THEOREM

(INDEPENDENT SOURCES)

Problem:

Find the current i, flowing through the 1 Ω resistance using the superposition principle.



Ans:

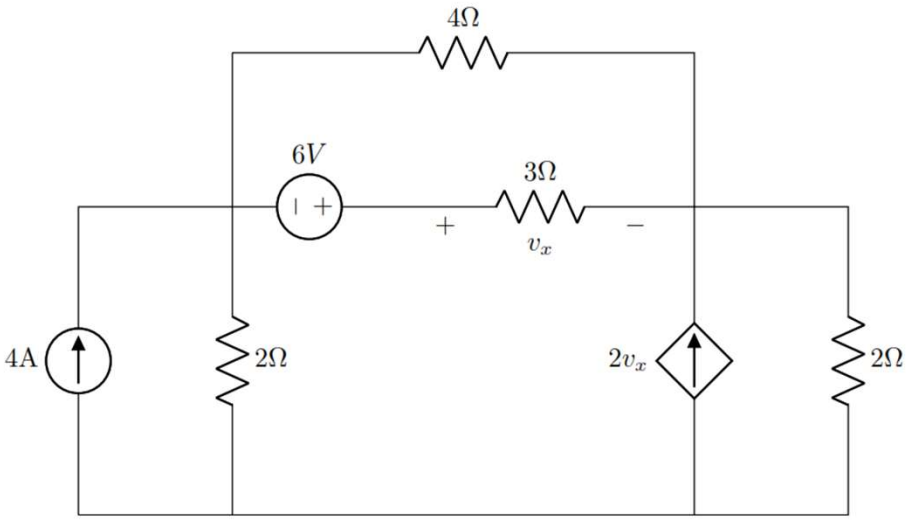
$\boldsymbol{i = 8A}$

SUPERPOSITION THEOREM

(DEPENDENT SOURCES)

Problem-22:

Determine the voltage developed across the 3Ω resistance i.e., v_x using the superposition theorem.



Ans:

$$\boldsymbol{v_x = 2.727\ V}$$

MAXIMUM POWER TRANSFER THEOREM

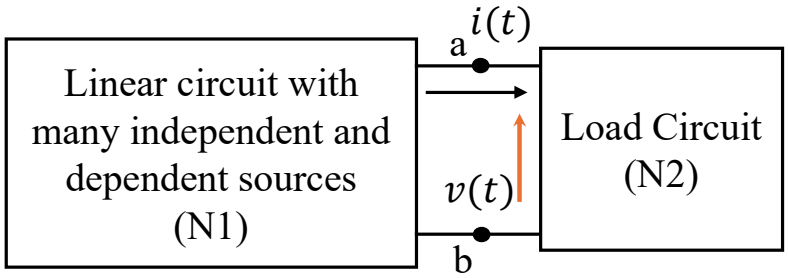
- Power delivered to the load circuit N2 by network N1 is maximum when equivalent load resistance is equal to the Thevenin's resistance of the network N1.

- Maximum power is

$$P_{max} = \frac{V_{oc}^2}{4R_L}$$

Here R_L is the equivalent load resistance of the load circuit N2

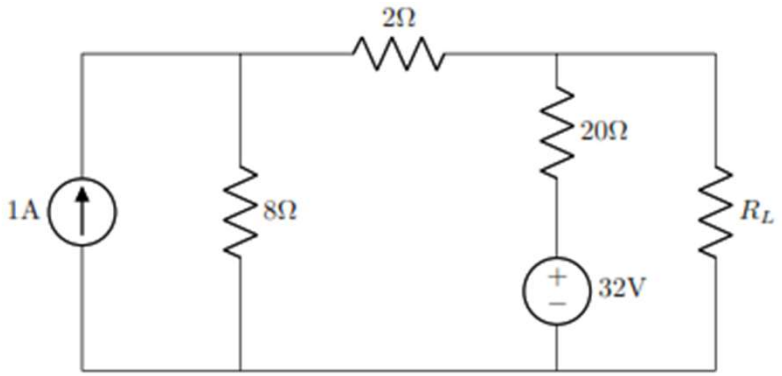
- Efficiency of the power transfer is 50%.



MAXIMUM POWER TRANSFER THEOREM

Problem-23:

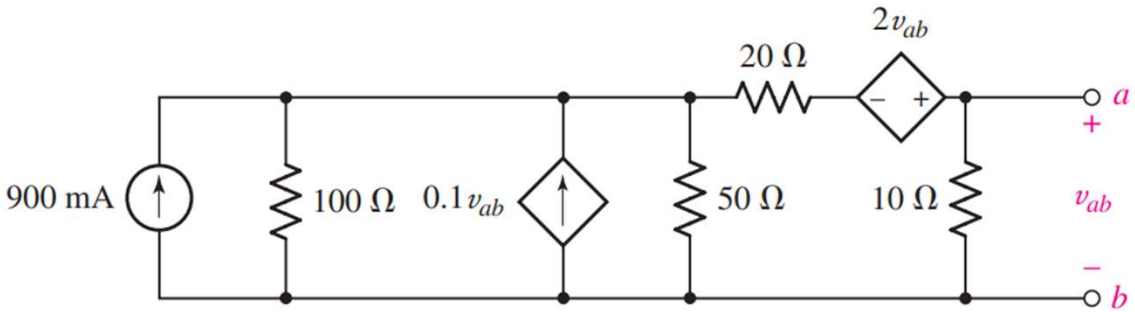
For the given circuit determine the maximum power transferred to R_L by using the Maximum Power Transfer theorem.



Ans:

$$P_L^{max} = 9.6\ W$$

EXTRA PROBLEMS



Problem-25:

Determine what value of resistance will absorb maximum power when connected across the terminal *a*-*b*.

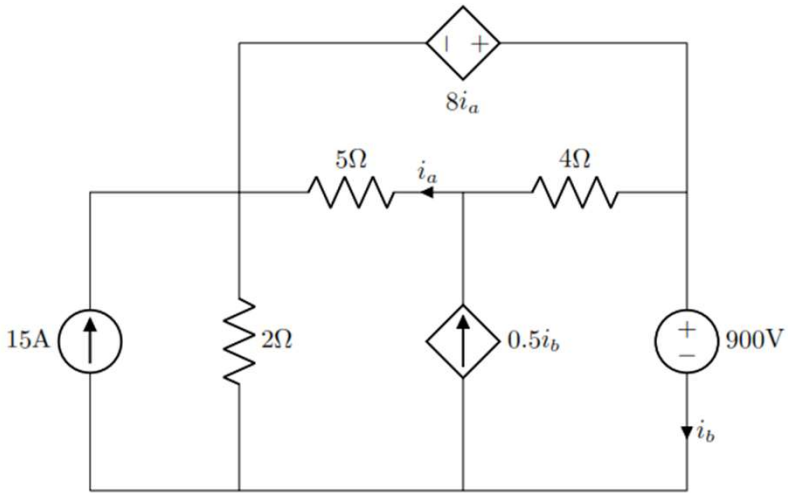
Ans:

$$R_L = 53.3333\ \Omega$$

EXTRA PROBLEMS

Problem-24:

Determine the values of i_a, i_b.



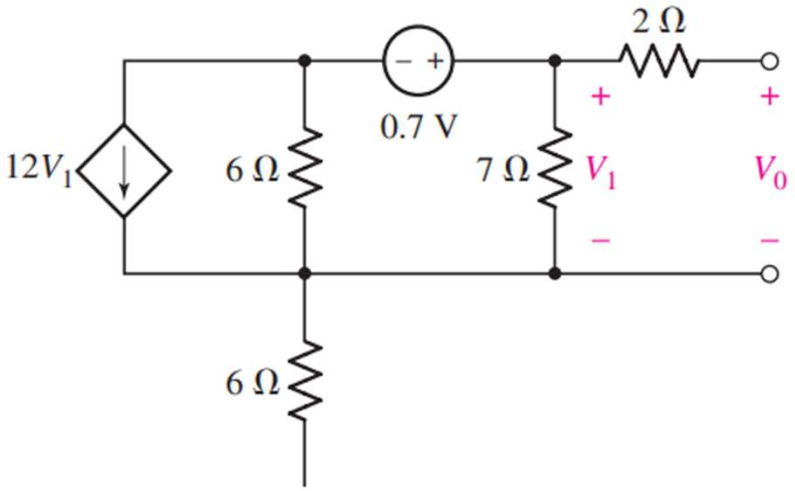
Ans:

$$i_a = ? \, A$$
$$i_b = ? \, A$$

EXTRA PROBLEMS

Problem-26:

Determine the V_0 in the circuit.



Ans:

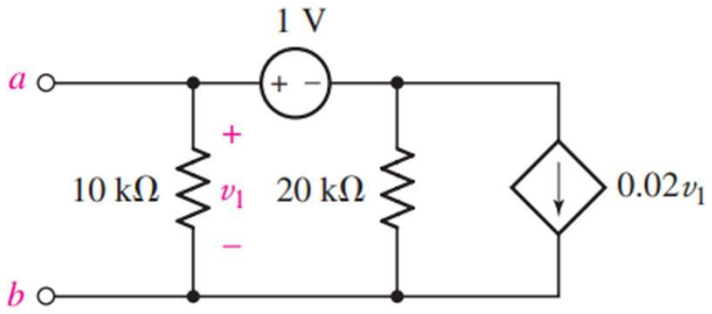
$$\boldsymbol{V_0 = 9.478\ mV}$$

EXTRA PROBLEMS

Problem-26:

Determine the power dissipated for

- 1 kΩ resistor connected between a-b terminal.
- 10.54 kΩ resistor connected between a-b terminal.



Ans:

$$P_{1k} = 5.587\ nW$$
$$P_{10.54\,k} = 578.5\ pW$$