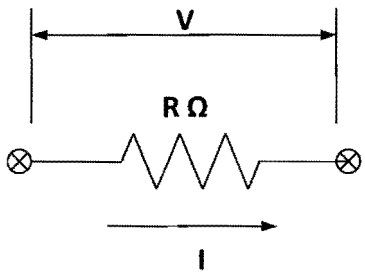
1

1. <8 Marks>

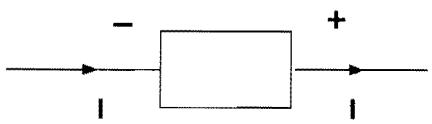


(a) Complete the following table.

V volts	I amps	R ohms	P watts
100	10	10	1000
60	20	3	1200
50	10	5	500
200	10	20	2000
75	2	37.5	150
50	10	5	500

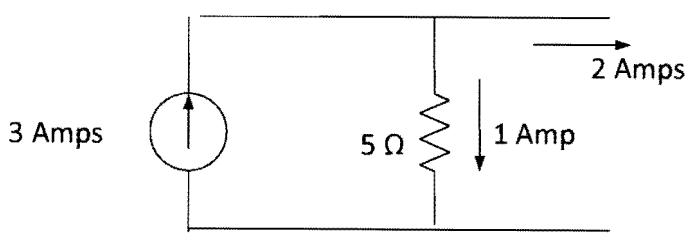
½ MARK EACH

(b)



This component is: (Check one)
Consuming Power? _____
Supplying Power? ✓ (1)

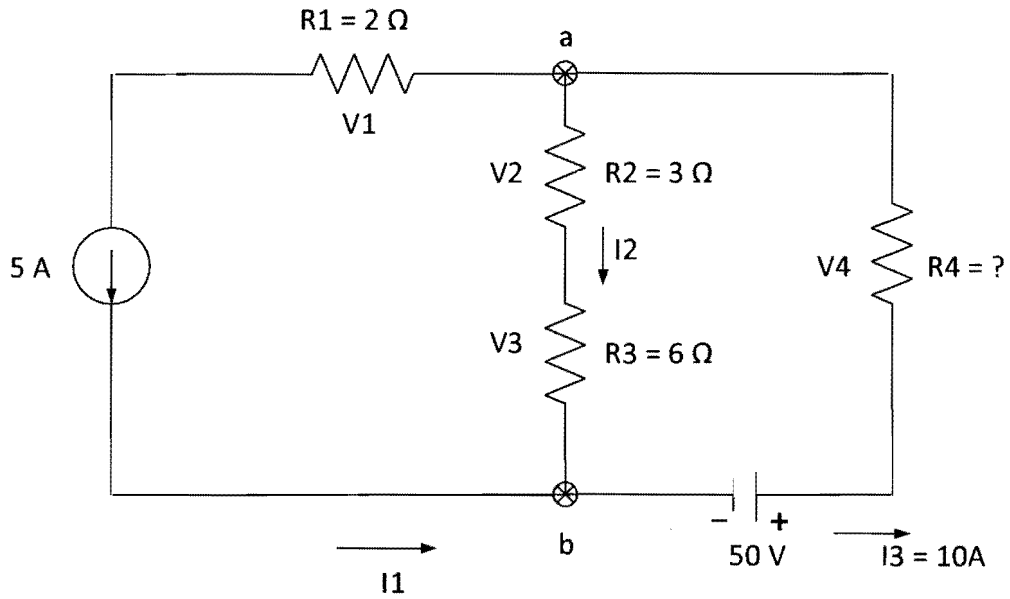
(c)



The constant current source is supplying? 15 (1) watts

TOTAL 8 MARKS

2. <12 Marks>



For the above circuit:

a) Apply KCL to determine I2
b) Apply Ohms Law to determine V_{ab}
c) Determine the value of R4
d) Determine the total power loss in all resistors
e) Determine the power supplied ~~(+)~~/consumed ~~(-)~~ by
    1) The 50 volt battery
    2) The constant current element.

(a) At node "b" $I_1 + I_2 - I_3 = 0$

$5A + I_2 - 10 = 0$

$\therefore I_2 = 5A$ (2)

(b) $V_{ab} = V_2 + V_3 = I_2(R_2 + R_3)$

$= 5(3+6) = 45V = V_{ab}$ (2)

(c) $V_{14} = +45 - 50 = -5V$

$I_3 = 10A$

$R = \frac{V}{I} = \frac{5}{10} = \frac{1}{2}\Omega$ (3)

(d) R_1: $5^2 \times 2 = 50\,W$

R_2: $5^2 \times 3 = 75\,W$

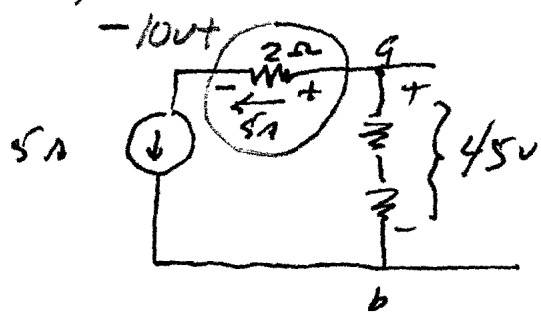
R_3: $5^2 \times 6 = 150\,W$

R_4: $10^2 \times \frac{1}{2} = 50\,W$

$\Sigma = 325$ WATTS (2)

(e) 1) 50V BATTERY: $50 \times 10 = 500$ WATTS (1)

2) CONSTANT CURRENT SOURCE



∴ VOLTAGE ACROSS 5A SOURCE $-10 + 45 = 35V$ (2)

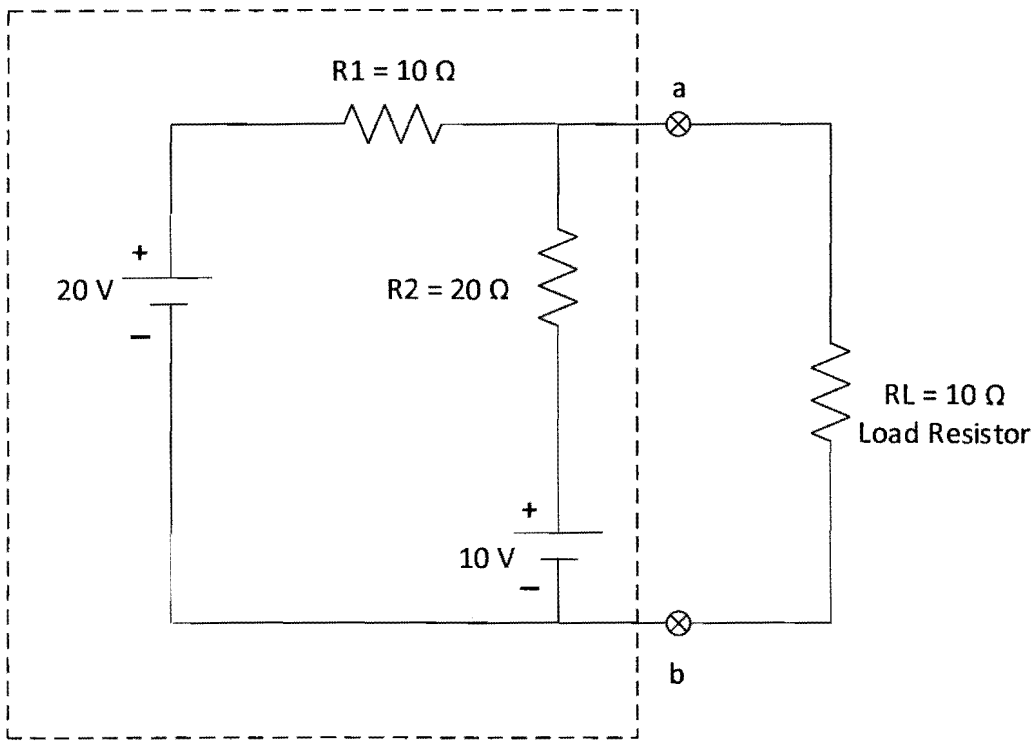
∴ POWER $= 5 \times 35 =$ 175 W

CHECK

$500 - 175 = 325\,W$ = POWER CONSUMED BY RESISTORS.

TOTAL 12 MARKS

3. <10 Marks>



a) Determine V_t and R_t, and draw the Thevenin equivalent for the circuit driving the load resistor RL

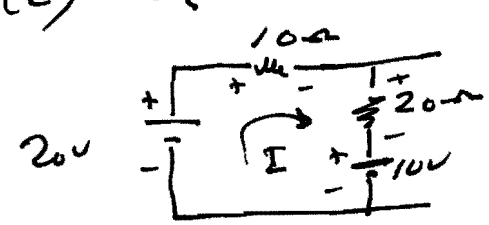
b) Convert a) to a Norton equivalent circuit

c) Determine the power delivered to the load resistor RL

d) What value of RL would result in maximum power dissipated in the load?

e) Calculate the power for this new value of RL.

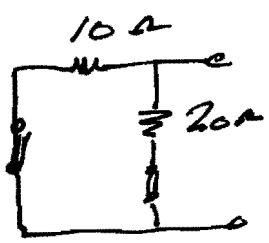
(a) $V_t = V_{oc}$



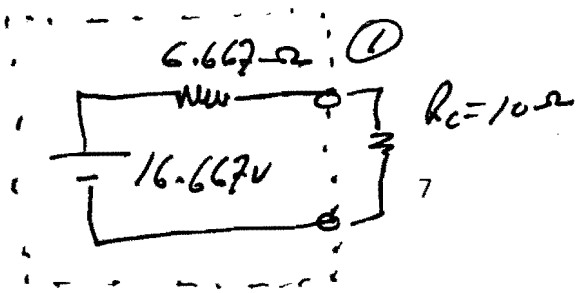
$I = \frac{(20-10)}{20+10} = \frac{10}{30}$

$\therefore V_{oc} = \frac{10}{30} \times 20 + 10 = 16.667\,V$ (2)

R_{Th}

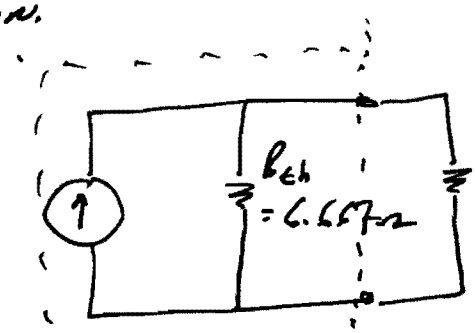


$R_{oc} = R_{Th} = \frac{20 \times 10}{20+10} = 6.667\,\Omega$ (1)



THEVENIN EQUIVALENT CCT.

(b) NORTON.



(2)

$I_N = \frac{V_{th}}{R_{th}}$

$= \frac{16.667}{6.667} = 2.5A$

(c) $P_L = I^2 R = \left(\frac{16.667}{6.667+10}\right)^2 \times 10 = 10$ WATTS (2)

(d) For max power $R_L = R_{th}$

$\therefore R_L = 6.667\Omega$ (1)

(e) $P_{max} = \left(\frac{16.667}{6.667+6.667}\right)^2 \times 6.667 = 10.417\,W$ (1)

TOTAL 10 MARKS