Name: _____Solution_____(please print)

Signature: _____

ECE 2201 – Quiz #4
October 24, 2019

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

_____/25

A Device shown in Figure 1 can be modeled as a voltage source in series with a 5[Ω] resistor. When connected to a network of resistors shown in Figure 2, this device delivers power of 3[W].

a) Find the equivalent resistance as seen by terminals **A** and **B**. Show your steps clearly. You are *encouraged* to **redraw** the circuit as needed.
b) Find the voltage source in the Device model.

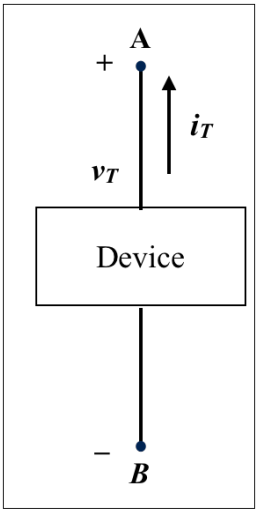

Figure 1.

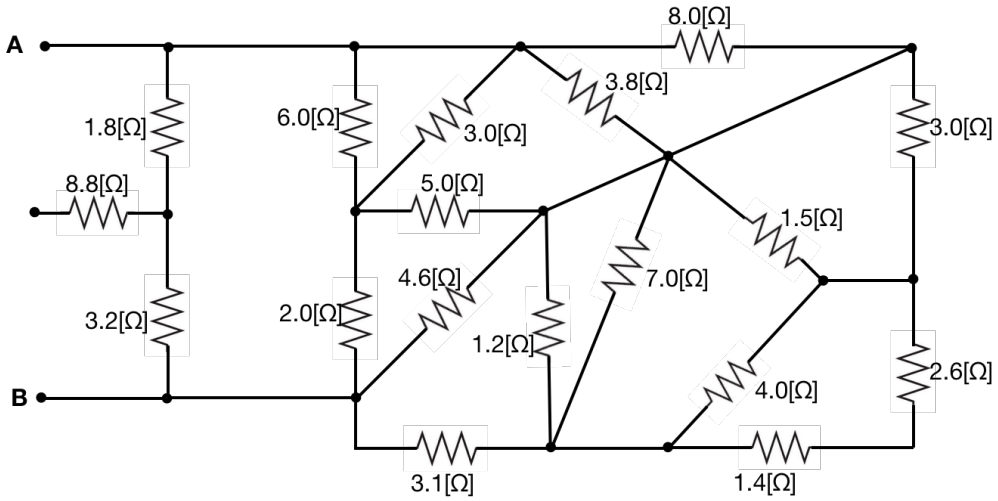

Figure 2.

Room for extra work

A Device shown in Figure 1 can be modeled as a voltage source in series with a 5[Ω] resistor. When connected to a network of resistors shown in Figure 2, this device delivers power of 3[W].

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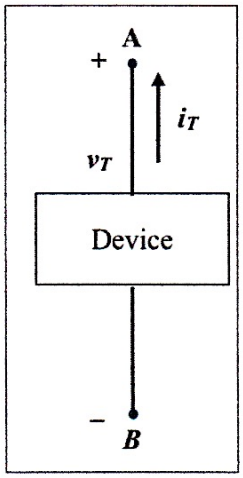


Figure 1.

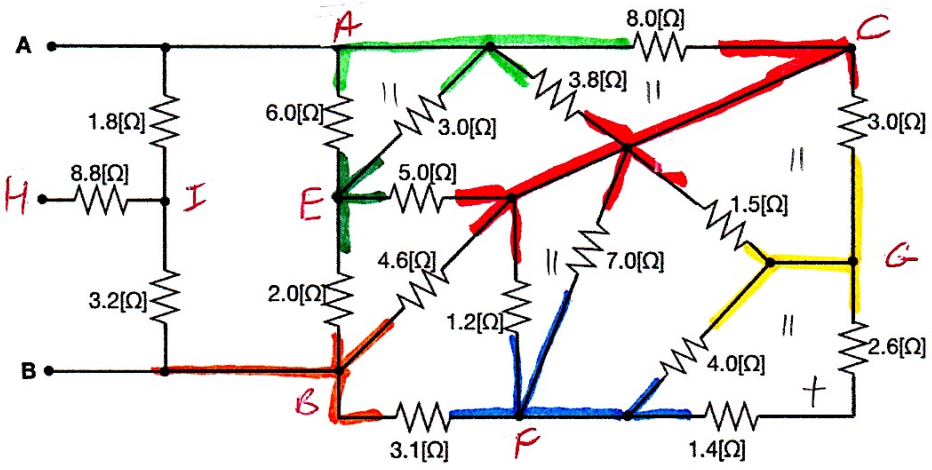


Figure 2.

(H-I) 8.8[Ω] can be removed

(A-B) 1.8 + 3.2 = 5[Ω]

AE $6[\Omega] \parallel 3[\Omega] = 2[\Omega]$

AC $8 \parallel 3.8 = 2.57[\Omega]$

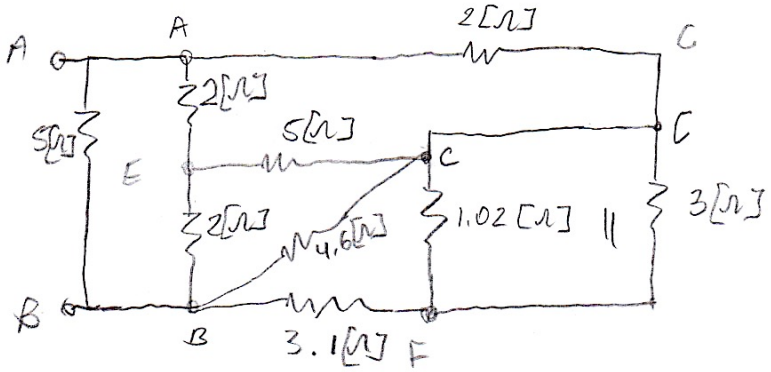
CF $1.2 \parallel 7.0 = 1.02[\Omega]$

FG $4.0 \parallel (1.4 + 2.6) = 2[\Omega]$

CG $3 \parallel 1.5 = 1[\Omega]$

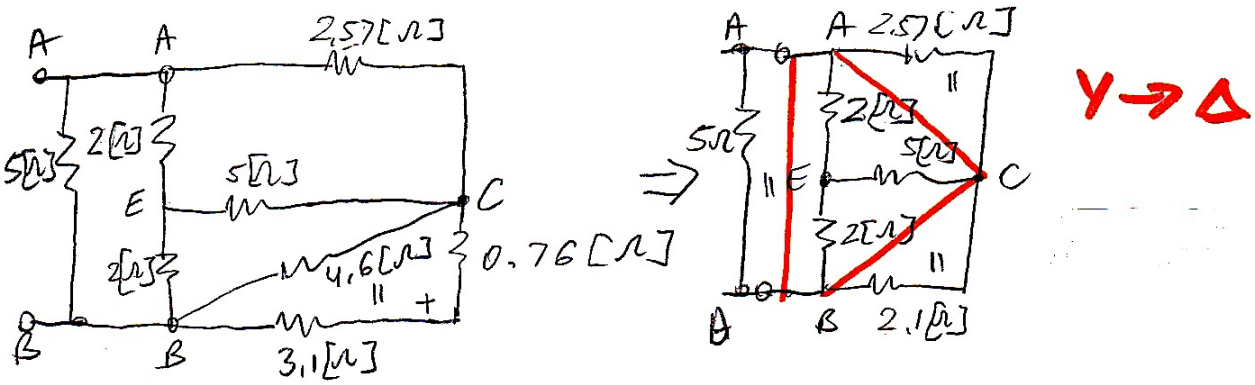
$\} \rightarrow 3[\Omega]$

Map the nodes of new equivalent resistors



CF → $1.02 \parallel 3 = 0.76[\Omega]$

Room for extra work

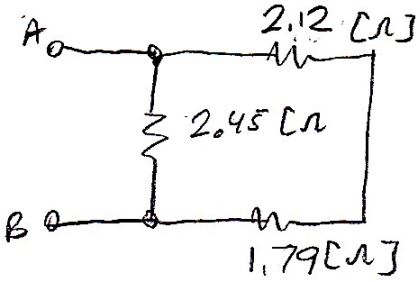


$BC \quad (3.1 + 0.76) \| 4.6 = 2.1\,[\Omega]$

$R_{AC_\Delta} = \dfrac{2.5 + 2.2 + 5.2}{2} = 12\,[\Omega] \rightarrow R_{AC_\Delta} \| 2.57 = 2.12$

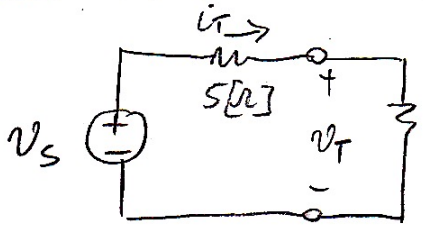
$R_{BC_\Delta} = \dfrac{24}{2} = 12\,[\Omega] \rightarrow R_{BC_\Delta} \| 2.1 = 1.79\,[\Omega]$

$R_{AB_\Delta} = \dfrac{24}{5} = 4.8\,[\Omega] \rightarrow R_{AB_\Delta} \| 5 = 2.45\,[\Omega]$



$R_{AB} = 2.45 \| (2.12 + 1.79) = 1.5\,[\Omega]$ (3.91)

Device delivers $3\,[W]$ to $1.5\,[\Omega]$



$v_S \cdot i_T = 3[W]$

$v_S \cdot \dfrac{v_S}{6.5\,[\Omega]} = 3[W]$

(so) $v_S = 4.416\,[V]$