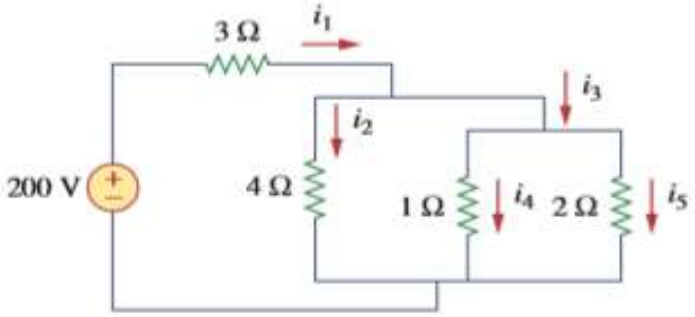
DC CIRCUIT

1. Find out the value of I_5, I_4, I_3, I_2, I_1 ?



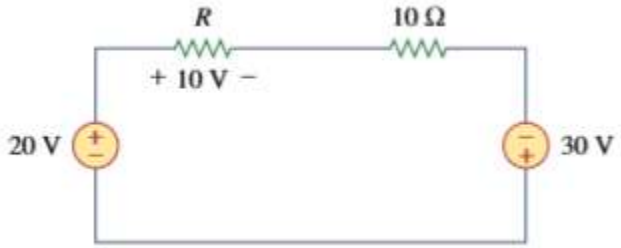
Solution: Total resistance $R_T=(2 \parallel 1 \parallel 4)+3=3.571\Omega$

$I_1=\frac{200}{3.571}=56A$ (Ans.)

$V_4=200-(56*3)=32V$

$I_2=\frac{32}{4}=8A$ (Ans.)
$I_3=56-8=48A$ (Ans.)
$I_4=\frac{48*2}{2+1}=32A$ (Ans.)
$I_5=48-32=16A$ (Ans.)

2. Find out the value of R.

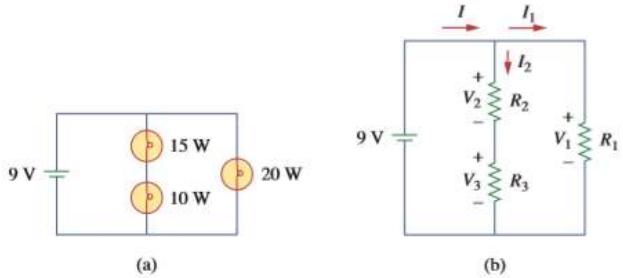


Solution: Apply KVL,

-20+10+10I-30=0
I=4A
$R=\frac{10}{4}=2.5\Omega$ (Ans.)

3. Find out the value

Three light bulbs are connected to a 9-V battery as shown in Fig. 2.56(a). Calculate: (a) the total current supplied by the battery, (b) the current through each bulb, (c) the resistance of each bulb.



Solution:

(a) The total power supplied by the battery is equal to the total power absorbed by the bulbs; that is,

$$p = 15 + 10 + 20 = 45 \text{ W}$$

Since $p = VI$, then the total current supplied by the battery is

$$I = \frac{p}{V} = \frac{45}{9} = 5 \text{ A}$$

(b) The bulbs can be modeled as resistors as shown in Fig. 2.56(b). Since R_1 (20-W bulb) is in parallel with the battery as well as the series combination of R_2 and R_3,

$$V_1 = V_2 + V_3 = 9 \text{ V}$$

The current through R_1 is

$$I_1 = \frac{p_1}{V_1} = \frac{20}{9} = 2.222 \text{ A}$$

By KCL, the current through the series combination of R_2 and R_3 is

$$I_2 = I - I_1 = 5 - 2.222 = 2.778 \text{ A}$$

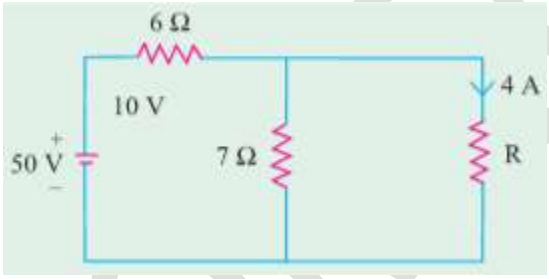
(c) Since $p = I^2R$,

$$R_1 = \frac{p_1}{I_1^2} = \frac{20}{2.222^2} = 4.05 \ \Omega$$

$$R_2 = \frac{p_2}{I_2^2} = \frac{15}{2.777^2} = 1.945 \ \Omega$$

$$R_3 = \frac{p_3}{I_3^2} = \frac{10}{2.777^2} = 1.297 \ \Omega$$

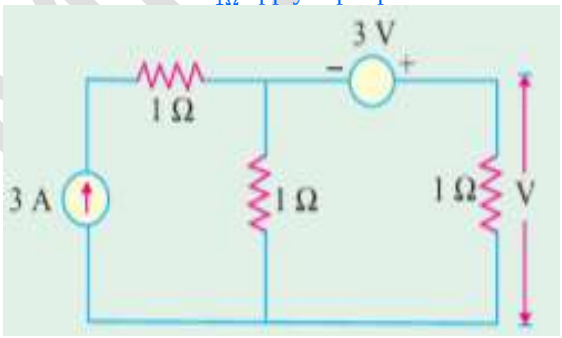
4. Find out the value of R



Solution: V_R=50-10=40V

R=$\frac{40}{4}$=10Ω Ans.

5. Find out the value of V & $P_{1\Omega}$ apply super position therem.



Solution:

When 3A active,

I′ = $\frac{3}{2}$ = 1.5A (↓)

When 3V active,

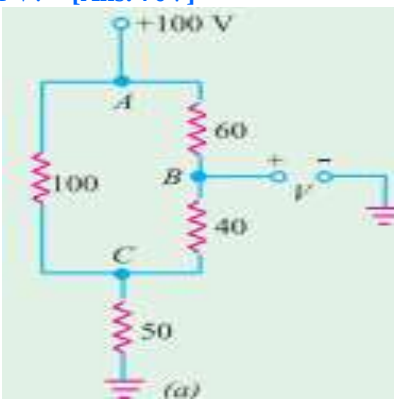
I″ = $\frac{3}{2}$ = 1.5A (↓)

I = 1.5 + 1.5 =3A (↓)

Voltage=3*1=3V (Ans.)

Power=$I^2R=3^2*1=9W$ (Ans.)

6. Find out the value of V? **[Ans: 70V]**



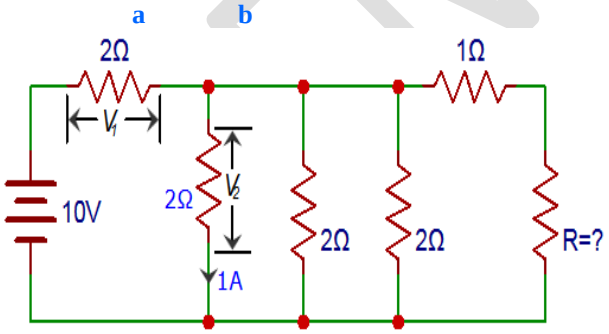
Solution: $I_T=\frac{100}{(60+40)\|100+50}=1A$

$I_{40}=\frac{1}{2}=0.5A$

(Because of "AC" Parallal resistance are equal. So current dividation is equal between the two ressistance)

V=(40*0.5)+50=70V (Ans.)

7. Find out the value of R? **[Ans: 1 Ω]**



Solution: $I_T=\frac{10-2}{2}=4A$

Apply KCL point a,

$I_T=1+x$

$4=1+x$

$X=3A$

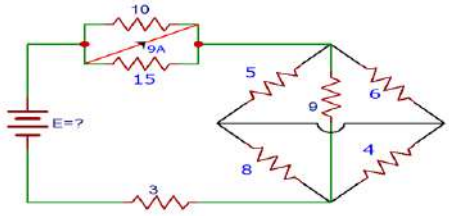
Apply KCL point b,

$I_R=3-(\frac{2}{2}+\frac{2}{2})=1A$

$1=\frac{2}{1+R}$

R=1Ω (Ans.)

8. Find out the value of E? **[Ans: 57.35 V]**



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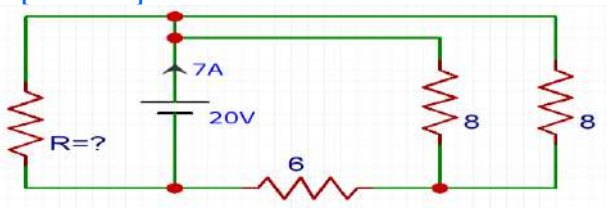
Solution: Firstly, Simplify this circuit.

$R_T=(5\|6+8\|4)\|9+3=6.3726\Omega$

$V=6.3726*9=57.3534V$ (Ans.)

9. Find out the value of R? **[Ans: 4 Ω]**



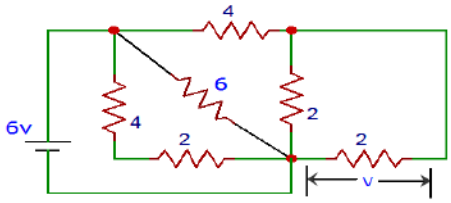
Solution: $R=(8\|8)+6=10\ \Omega$ $I=\frac{20}{10}=2A$

Apply KCL,

$I_R=7-2=5A$

$R=\frac{20}{5}=4\ \Omega$ (Ans.)

10. Find out the value of V? **[Ans: 1.2 V]**



Solution: Simplipy this circuit. How it will be simplipied. Then solve it own style.

$R_T=3\|5=1.875\Omega$, $I=\frac{6}{1.875}=3.2A$

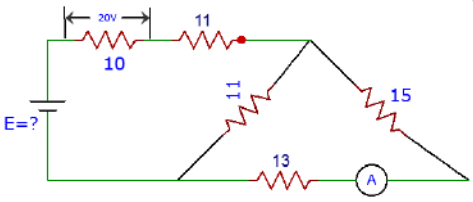
$I_4=3.2-2=1.2A$

$I_2=\frac{1.2}{2}=0.6A$

$V_2=0.6*2=1.2V$ (Ans.)

11. Find out the value of E and Ammeter Current?

[Ans: V=57.79 Volt, Ammeter current= 0.564 Amp]



Solution: $I_T=\frac{20}{10}=2A$

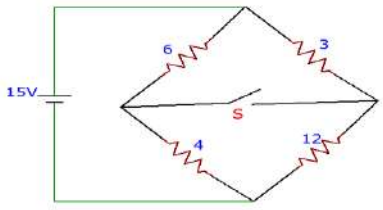
Applying current divider rule, $I_A=\frac{2*11}{11+15+13}=0.564A$ (Ans.)

Voltage drop of Ammeter branch $=0.564*(15+13)=15.795V$

Total voltage $E=20+(11*2)+15.795=57.795V$ (Ans.)

12. Find out the value of I_T ? [When S is open and, S is close]

[Ans: $I_{T(\text{S closed})}=3A$ $I_{T(\text{S open})}=2.5A$



Solution: When S is open,

$R_T=10\|15=6\Omega$ $I_T=\frac{15}{6}=2.5A$ (Ans.)

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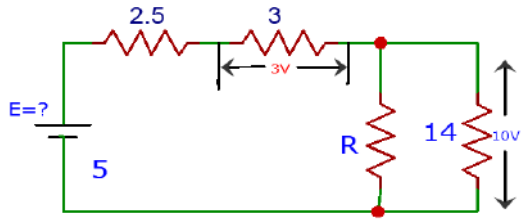
When S is closed,

$R_T=6\|3+4\|12=5\Omega \quad I_T=\frac{15}{5}=3A$ (Ans.)

13. Find out the value of E, R? **[Ans: V=15.5 Volt, R=35Ω] ***



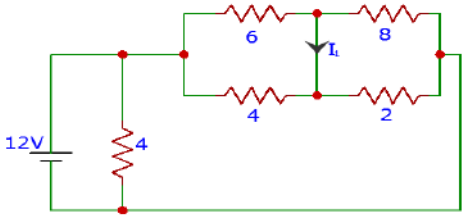
Solution: Applying KCL,

$I_R=I_T-I_{14}=1-\frac{10}{14}=0.2857A$

$R=\frac{10}{.2857}=35\Omega$ (Ans.)

Total voltage E=3+10+(2.5*1)=15.5V (Ans.)

14. Find out the value of I_T, I_1? **[Ans: I_T=6 Amp, I_1=0.6 Amp]**



Solution: $I_T=\frac{V}{R_T}=\frac{12}{(8\|2+6\|4)\|4}=6A$ (Ans.)

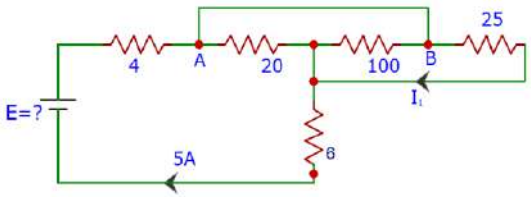
Apply KCL,

$I_6=I_1+I_8$

$$\frac{3*4}{6+4}=I_1+\frac{3*2}{8+2}$$

$I_1=0.6$ A (Ans.)

15. Find out the value of E, I_1? **[Ans: E=100 Volt, I_1=2 Amp]**



Solution: Very easy circuit. Don't fear. Apply point method. So, let's try.

$R_T=(20\parallel 100\parallel 25)+10=20\Omega$

$E=5*20=100V$ (Ans.)

$V_{25}=100-(10*5)=50V$

$I_1=\frac{50}{25}=2A$ (Ans.)

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