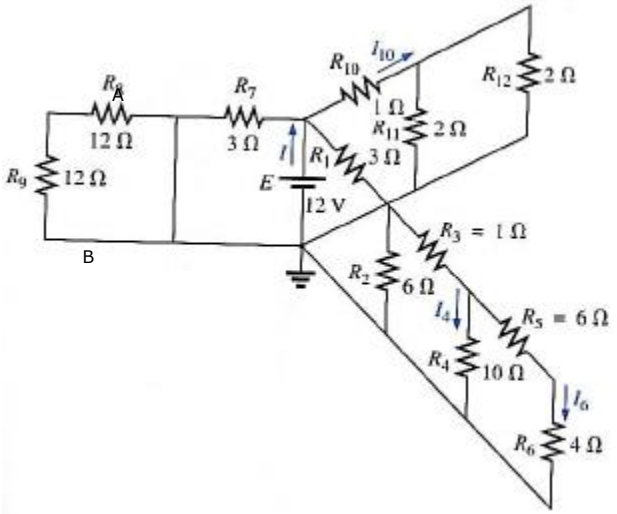
Q - For the multiple ladder configuration of Figure,

a. Determine current I through battery

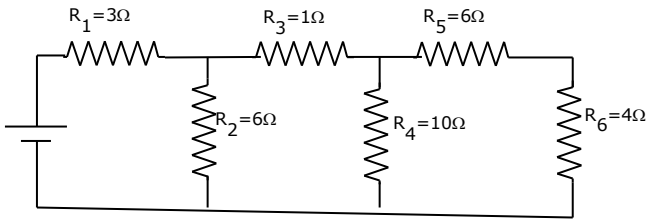
b. Calculate current I_4 through resistance R4

c. Find current I_6 through resistance R6

d. Find current I_{10} through resistance R10



The three ladders are parallel to each other and hence can be treated separately. For the first ladder



R5 and R6 are in series and their equivalent is 6 + 4 = 10 Ω

This is in parallel with R4 and makes a totaal 10*10/(10+10) = 5Ω

This is in series with R3 and hence the total is 5+1 = 6 Ω

This resistance is in parallel with R2 makes it 6*6/(6+6) =3 Ω

And this is in series with R1 makes total resistance of the ladder equal to 6 Ω

Total current through the first ladder is I_1=12/6 = 2 A

Now for the second ladder

The ends of the series of R8 and R9 are connected by a conducting wire and hence the net resistance will be zero. The only effective resistor is R7 and hence the current in this ladder will be

I_7 = 12/3 = 4 A

For the third ladder

In the third ladder R11 and R12 each of 2Ω are in parallel equals to 1Ω and in series with R10 makes total resistance of the ladder equal to 2Ω. Hence the current in the third ladder will be

I_{10} = 12/2 = 6A

a. The current I through the battery is the total current given to the three ladder and will be equal to

I = I_1 + I_7 + I_{10} = 2 + 4 + 6 = **12 A**

b.c. As the equivalent of R3, R4, R5 and R6 is 6Ω which is in parallel with R2 = 6 Ω. The current will equally divided in the two branches and hence current through R3 is 1A which is again equally divided in to the series of R5 and R6 and R4 in parallel hence

I_4 = I_6 = **0.5 A**

d.

I_{10} is the total current through the third ladder and equal to **6A** as shown above.