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Phy301- Circuit Theory

Solved Mid Term MCQS and Subjective with References.

Phy301-Mid Term Solved With Refrences

VIRTUAL UNIVERSITY
OF PAKISTAN

By Masoom Fairy

Question No: 1 (Marks: 1) - Please choose one

If we connect 3 capacitors in series, the combined effect of all these capacitors will be

► equal to the sum of individual capacitors
► the sum of reciprocals of individual capacitors **Page 22**
►zero
► product of all

Question No: 2 (Marks: 1) - Please choose one

A node which emerges as a result of combination of two ordinary nodes is called
► Heavy node
► Simple node
► Super mes
► Super node **Page 52**

Question No: 3 (Marks: 1) - Please choose one

Unit of inductance is
► mho
► ohm
► Henry   **page 19**
► Farad

Question No: 4 (Marks: 1) - Please choose one
Reciprocal of resistance is
► Conductance
► Inductance
► Capacitance **Page 22**
► Resistivity

Question No: 5 (Marks: 1) - Please choose one
An ideal voltage source is a circuit element where the voltage across it is independent of
► resistance
► current **Page 26**
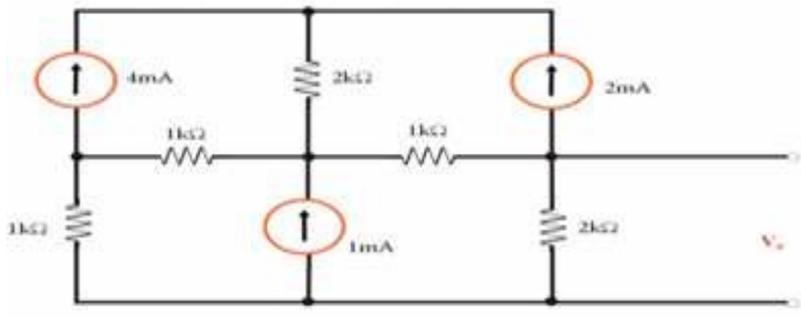► capacitance
► inductance

Question No: 6 (Marks: 1) - Please choose one
Sum of all currents entering in the node is equal to sum of currents leaving the node, is statement of

► Ohm's law
► Kirchhoff's current law **LECTURE 7**
► Jaime's law
► Rutherford's law

Question No: 7   (Please choose one

Which current source will be used for super mesh?

| **Solved By Masoom Fairy** | Page | 2

► 4mA

► 2mA

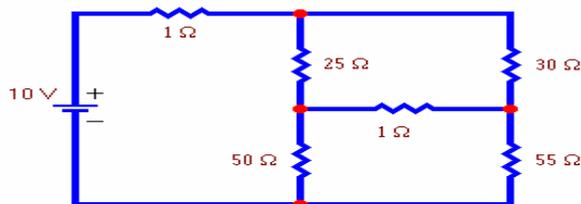► **1Ma** when two meshes share current source then it became super mesh

► 2mA ands 4mA

Question No: 8   - Please choose one

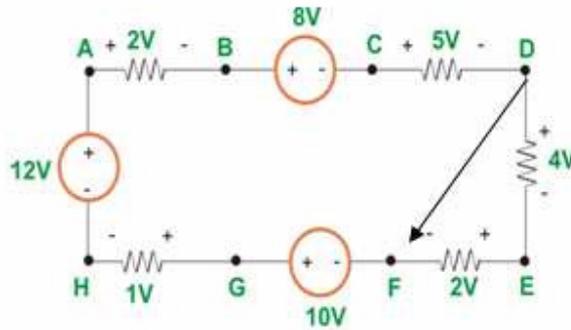How many KVL equations can be written for the given circuit?

► 2

► 4

► **3** because 3 meshes or loops are formed and number of loops is equal to number of equations.

► 1

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Question No: 9   - Please choose one

For the given circuit, voltage V_{DF} is
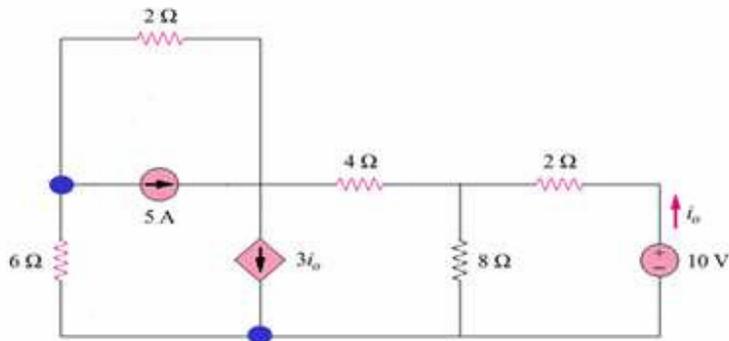

 ► 6v

 ► 2v

 ► 4v

 ► 10v

Question No: - Please choose one

 If a parallel circuit is open in main line, the current

> ► increases in each branch

> ► is zero in all the branches

> ► is zero only in the branch that has highest resistance

> ► increases in the branch that has lowest resistance.

Question No: 11   - Please choose one

How many loop equations can be written for this circuit?

► 2

► **4**
  LOOP
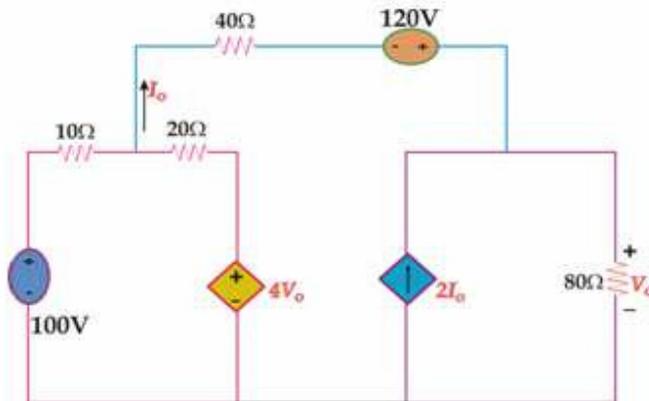 It is the closed path for the flow of current in which no node is encountered more than once.

► 3

► 5

Question No: 12   ) – Please choose one

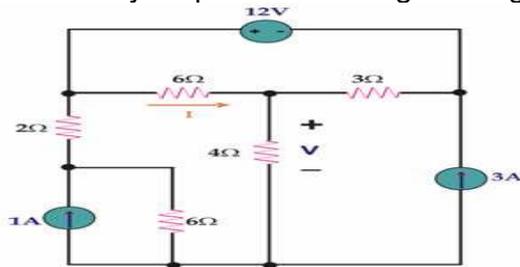How many sources are dependent sources in given circuit?

► 3

► 2

► 4

► 1

Question No: 13   - Please choose one

How many loops can be assigned to given figure?
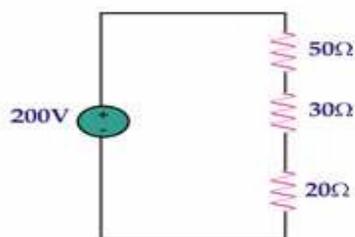

► 2

► 4

► 3

► 5

Question No: 14   - Please choose one

Through which resistance most current will flow

► 50Ω

► 30Ω

► 20Ω

► same through all resistance Because same current flowing through series combination.   Page 32

| Solved By Masoom Fairy | Page | 6

Question No: 15 - Please choose one

In given circuit power dissipated across each bulb is 20w.What would be the resistance of each bulb.

► 5Ω

P=V*I
20 = V*2A
20/2 = V
V=10v
So,
R=V/I = 10/2 = 5 ohm =Ans………

► 10Ω
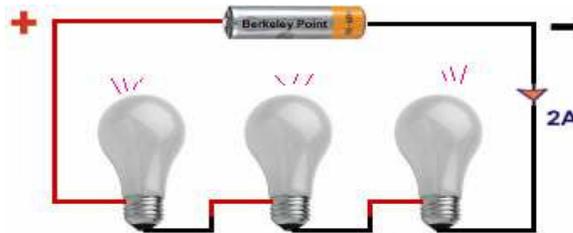
► 40Ω

► 20Ω

Question No: 16 - Please choose one

In the figure below Voltage drop across 7Ω will be

► 20v

► 14v
V=R/RT*VS
So,
V=7/10*20 =14V

► 6v

► 10v

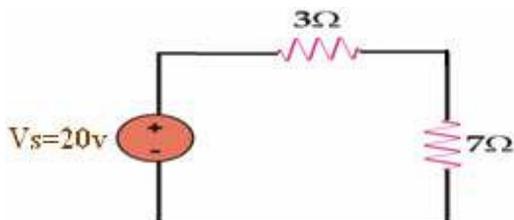**Question No: 17   - Please choose one**

If current flowing through 4Ω is 1Ma, voltage drop across it will be
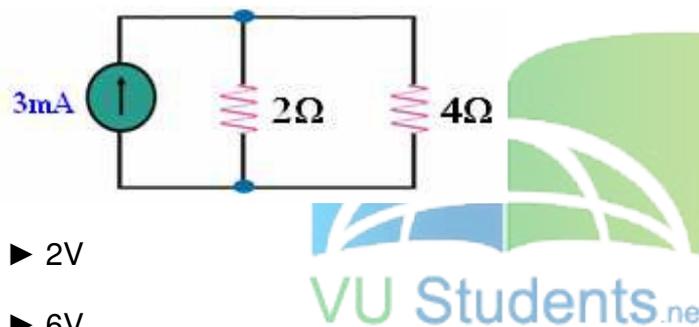
► 2V

► 6V

► 4V **not sure**

► 12V

Question No: 18   - Please choose one

For the given figure current flowing through 5Ω is
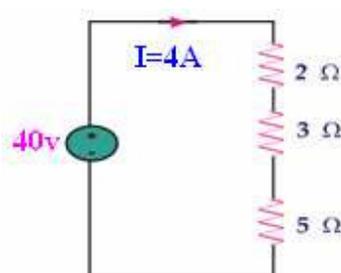
► 5A

► **4A** same current will flow in series circuit.

► 10A

► 2A

Question No: 19   - Please choose one
The value of Ia for given circuit is

► Ia=Io

► Ia= 3A

► **Ia= -3A** Current is not in same direction with 3A.

► Ia=6v

Question No: 20   - Please choose one

In the given circuit the value of independent current source is

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► Ix

► <mark>Ix/2</mark> **not sure**

► 6Ma

► IL

MID TERM EXAMINATION
SEMESTER Fall (2004)I
PHY- 301 CIRCUIT THEORY

(a) **When placed close together, a positively charged material and a negatively charged material will**
a) Repel
b) Become neutral
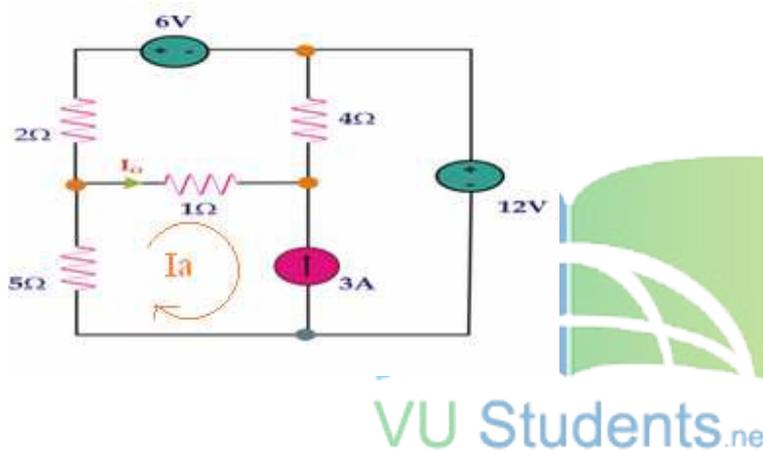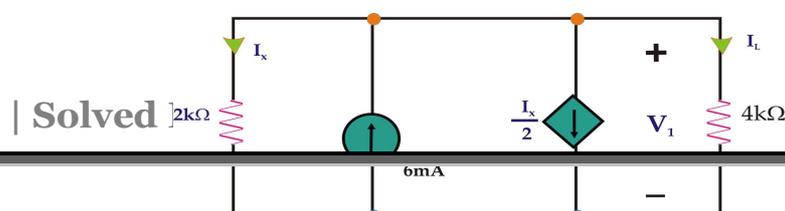<mark>c) Attract</mark>   **Page 9**
d) Exchange charges

II) Potential difference is another term for
a) Energy
<mark>b) Voltage</mark> **Page 8**
c) Watt
d) Distance of an electron from the nucleus.

III) There is no current in the circuit when
a) A switch is closed
b) A switch is open
c) There is no voltage
d) Answer (a) and (c)
<mark>e) Answer (b) and (c)</mark>

IV) How much resistance is required to limit the current from a 10V battery to 1Ma
a) 100Ω
b) 1**.**0 k Ω
c) 10 Ω

| **Solved By Masoom Fairy** | Page | 10

d) 10k Ω **R=V/I**
So, R=10/1=10 ohm

V) Which of the following statements are true concerning the figure below
a) R_1 and R_2 are in series with R_3, R_4, and R_5
b) R_1 and R_2 are in series
c) R_3, R_4, and R_5 are in parallel
d) The series combination of R_1 and R_2 is in parallel with the series combination of R_3, R_4, and R_5.
e) Answers (b) and (d)

MID TERM EXAMINATION SEMESTER (Summer 2007) I
PHY- 301 CIRCUIT THEORY

(b) **Current divider is used when**
a) two or more resistances are in series to a voltage source
b) two or more resistances are in parallel to a current source   **Sure**
c) One resistance in parallel to current source
d) None of above

II) 10Ω and 5Ω resistances are in series. If current through 5Ω is 5 ampere , current of 10Ω will be
a) 10A
b) 20A
c) 5A **Page 32 Current will be same.**
d) 40

III) If the current arrow is directed into the + marked terminal of an element, then p=vi yields the………………...
a) absorbed power **Not sure**
b) emitted power
c) loss power
d) high power

IV) When a proton and an electron come close together they
a) repel each other
b) become neutral
c) have no effect
d) attract each other   **Page 9**

V) The resistance of an open circuit is
a) high
b) low

| **Solved By Masoom Fairy** | Page | 11

c) zero
d) infinite
VI) The current passing through the conductor is directly proportional to the voltage provided temperature remains constant, is the statement of
a) Kirchhoff's law
b) Newton's law
c) Ohm's law **Page 24**
d) Pascal law

MIDTERM EXAMINATION
Fall 2009
PHY301- Circuit Theory

Question No: 1   (Marks: 1) – Please choose one

Which of the following statements is correct.

► **Neutrons and protons lie inside the nucleus.** **Lecture 1 Page 4, 5, 6..**

► Protons revolve around the nucleus.

► Neutron is +ve particle.

► Electron lies inside nucleus

Question No: 2   (Marks: 1) – Please choose one

Current through a short circuit is

► zero

► minimum

► **Maximum** **Page 14 'Topic Short Circuit'.**

► leakage current
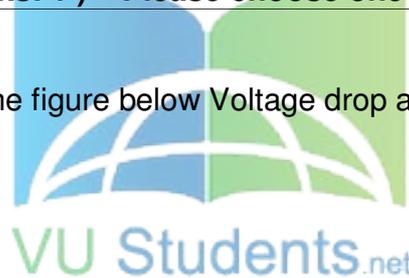
Question No: 3   (Marks: 1) – Please choose one

When two resistances are connected in series

►They must both have same resistance value

► The voltage across each must be the same.
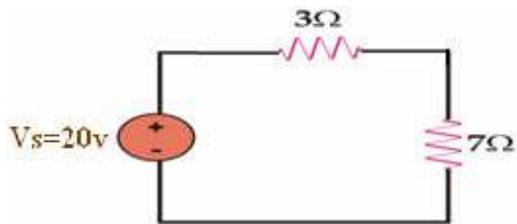
► They must have different resistance value.

► **There is only one path for current for both resistances** **Sure**

Question No: 4   (Marks: 1) – Please choose one

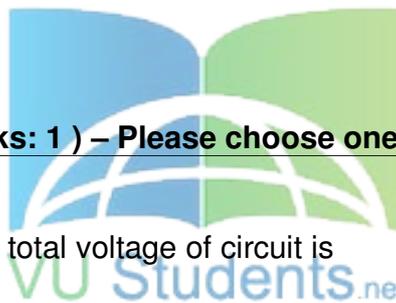Using voltage divider in the figure below Voltage drop across 3Ω will be
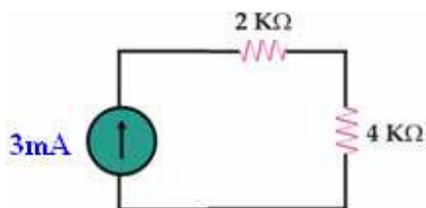
► 20v

► 14v

► **6v**
   V=R/Rt*Vs
   = 3/10*20 = 6v = Answer

► 7v

Question No: 5   (Marks: 1) – Please choose one

In the given series fig. the total voltage of circuit is

► 6V

► 12V

► **18V**
   V=IR
   = 3Ma * 4+2 = 3Ma * 6
    = 18V= Ans….

► 10V

Question No: 6   (Marks: 1) – Please choose one

In given circuit power dissipated across each bulb is 20w.What would be the resistance of each bulb.

▶ **5Ω P=V*I**
  20 = V*2A
  20/2 = V
  V=10v
  So,
  R=V/I = 10/2 = 5 ohm =Ans………

▶ 10Ω
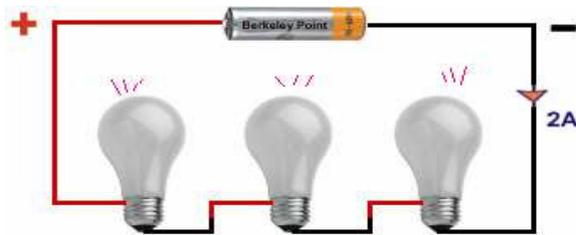
▶ 40Ω

▶ 20Ω

Question No: 7   (Marks: 2)

What is the unit of capacitance and Inductance?

Answer:
The SI unit of capacitance is the farad; 1 farad = 1 coulomb per volt.
The unit of inductance is the henry (H) named after American scientist and magnetic researcher Joseph Henry. 1 H = 1 Wb/A

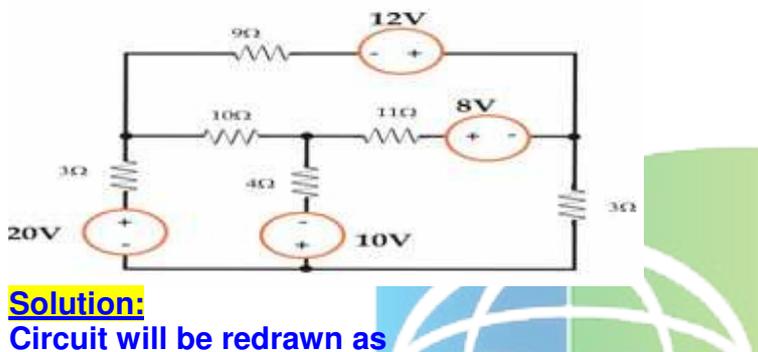**Question No: 8   (Marks: 2)**

Define KIRCHHOFF'S VOLTAGE LAW (KVL):

Answer:
Kirchhoff's Voltage Law (or Kirchhoff's Loop Rule) is a result of the electrostatic field being conservative. It states that "the total voltage around a closed loop must be zero". If this were not the case, then when we travel around a closed loop, the voltages would be indefinite. So, ∑V=0
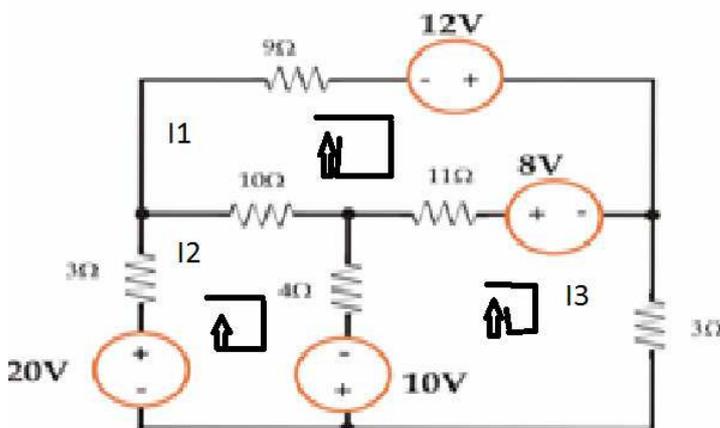
Question No: 9   (Marks: 3)

Draw and label loop currents for circuit.write kvl for any one loop equation.

Solution:
Circuit will be redrawn as

KVL for loop 1 is

$$9I_1 + 1_2 + 8 + 11\left(I_1 - I_3\right) + 10\left(I_1 - I_2\right) + 9I_1$$

Question No: 10   (Marks: 5)

You are given the circuit Use Current Division Rule directly to find **I₃₀**.
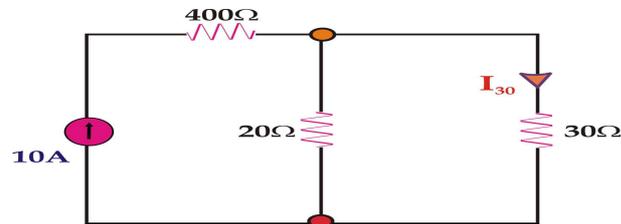
Solution:
Formula is
$I_1 = R_2/R_1 + R_2$

AS we see that 30 ohm is in parallel with 20 ohm, So the resistance will become 12 ohm..
Now,
$U \sin g \ formula, \ we \ have$

$$I_{30} = \frac{400}{400+12} \times 10$$

$$= \frac{4000}{412}$$

$$= 9.7A$$

Question No: 11   (Marks: 5)

Determine the value **I4** for the given network.

Solution:
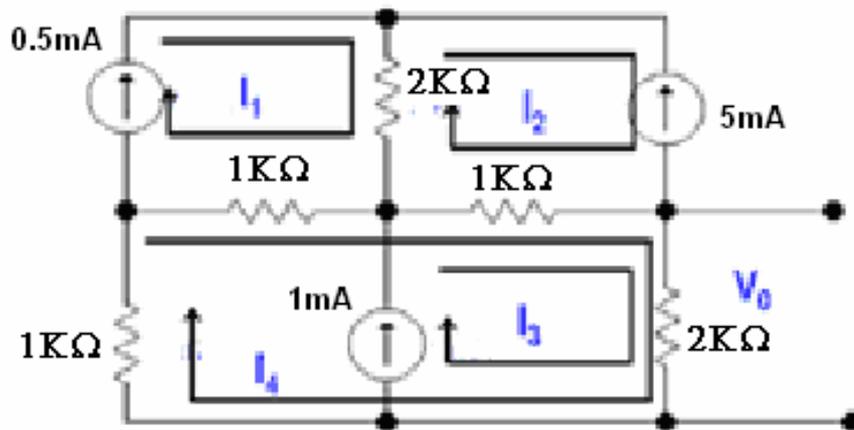
$I_1 = 0.5mA,$

$I_2 = -5mA,$

$I_3 = 1mA$

$FOR\ I_4$

$1k(I_4 - I_1) + 1K(I_4 - I_2) + 1KI_3 + 2KI_3 + 1KI_4 = 0$

$= 2KI_4 - 1KI_2 + 3KI_3 = 0$

$PUTTING\ I\ VALUES$

$= 2KI_4 - 5 + 3 = 0$
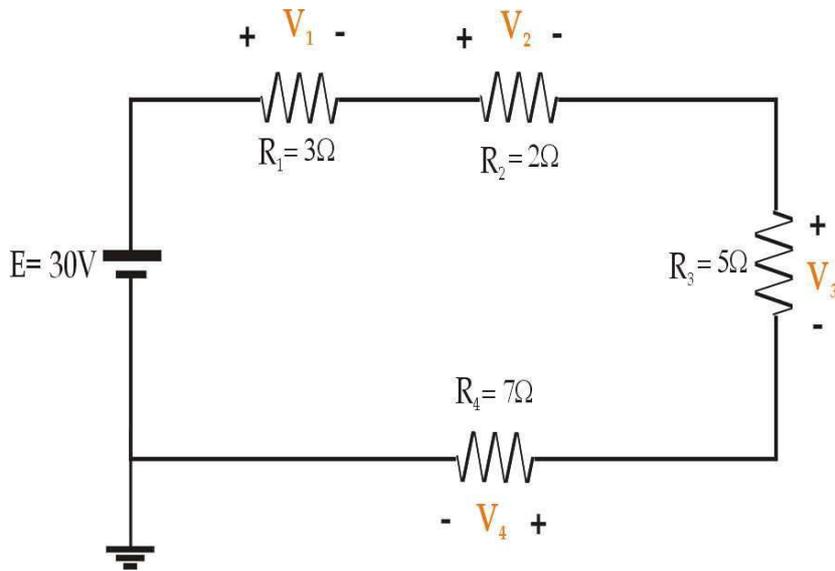
$= 2KI_4 - 2 = 0$

$= I_4 = \dfrac{2}{2} = 1mA....$

Question No: 12   (Marks: 10)

___

   If 1.76A current is flowing through circuit
  Calculate the power dissipated by R_1, R_2 ,R_3 and R_4Determine the power delivered by the source, Write each step of the calculation to get maximum marks and also mention the units of each derived value.

Solution:

I=1.76 A
As the formula for power delivered by source is

$$P = \frac{V^2}{R}$$

So,

$$P = \frac{30^2}{17} = \frac{900}{17}$$

$$P = 52.94 \; Watts$$

Now Power dissipated in each resistor will:

$P = I^2 R$

$P_1 = (1.76)^2 \times 3$

$P_1 = 9.2 watts$

$P_2 = (1.76)^2 \times 2$

$\quad = 6.19 \; watts$

$P_3 = (1.76)^2 \times 5$

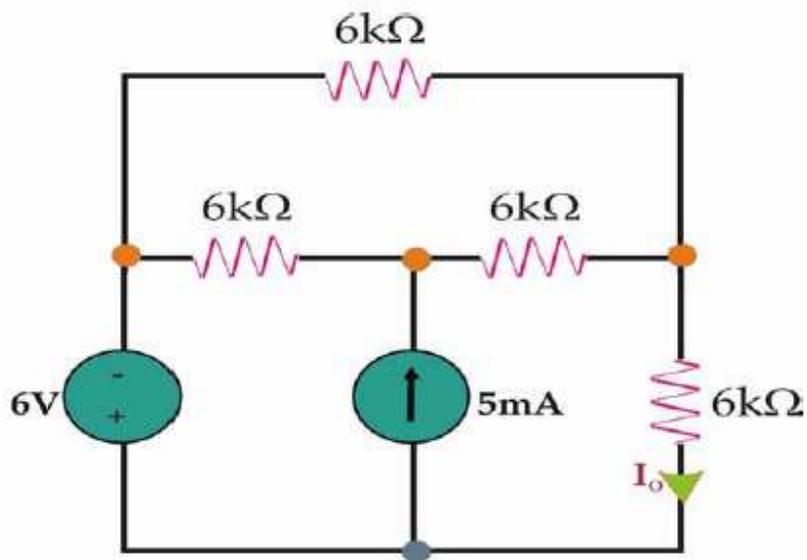$\quad = 15.48 \; watts$

$P_4 = (1.76)^2 \times 7$

$\quad = 21.68 \; watts$

MID TERM EXAMINATION
SEMESTER Fall (2004)I
PHY- 301 CIRCUIT THEORY

Question:

Use nodal analysis to find I_o in the given network.. Identify and label each node otherwise you will lose your marks. Label circuit diagram properly.

Answer/Solution

We will redraw figure as
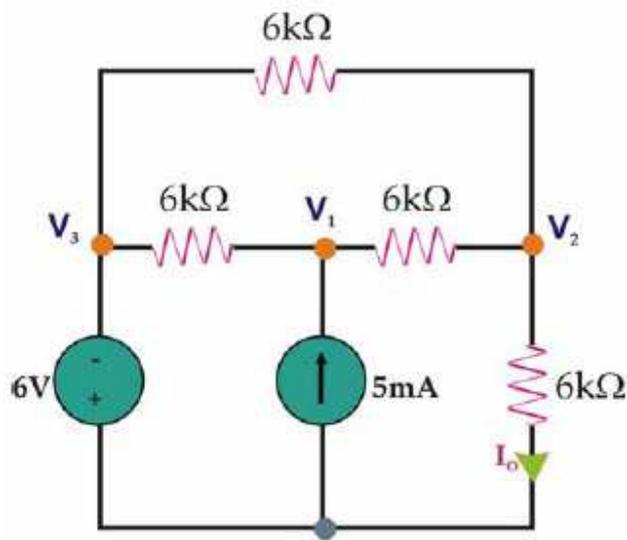
At Node 3
V_3 = -6V
KCL at Node 1
$(V_1 + 6)/6 + (V_1-V_2)/6 = -5Ma$ ------ (A)
KCL at Node 2
$(V_2 + 6)/6 + (V_2-V_1)/6 + V_2/6= 0$ ------ (B)
Solving (A) and (B) we get
V_2=12/5 = 2.4
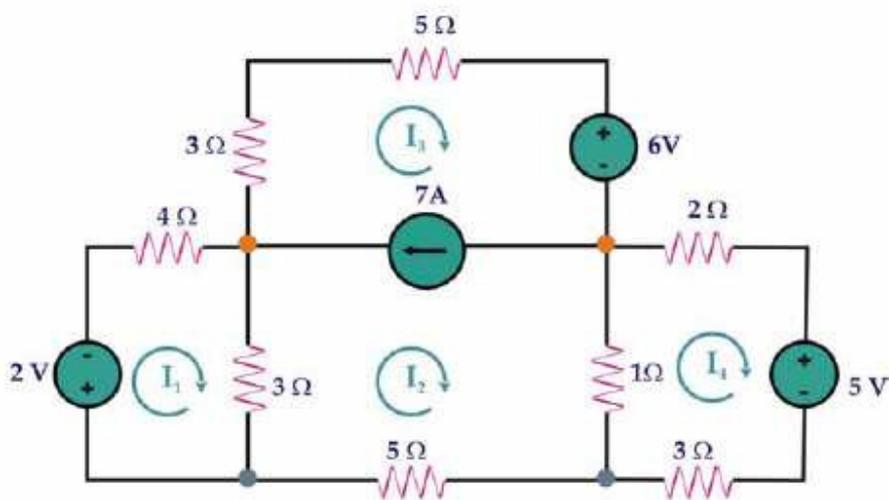**Now $I_o = V_2/R$ =2.4/6 =.4 Ma**

QUESTION:

Use Mesh analysis to find currents through all Meshes. Identify and label each mesh otherwise you will lose your marks. Label circuit diagram properly.
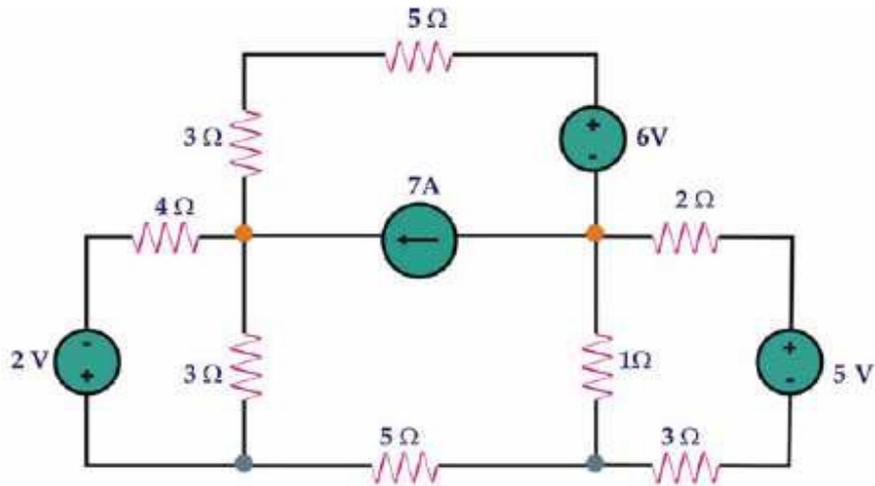
Solution:
We will redraw figure as:

KVL equation for mesh 1
2+4 I1+3 (I1-I2) =0
$7I_1 - 3I_2 = -2$ -------------------- (1)
Now we will redraw figure for super mesh as
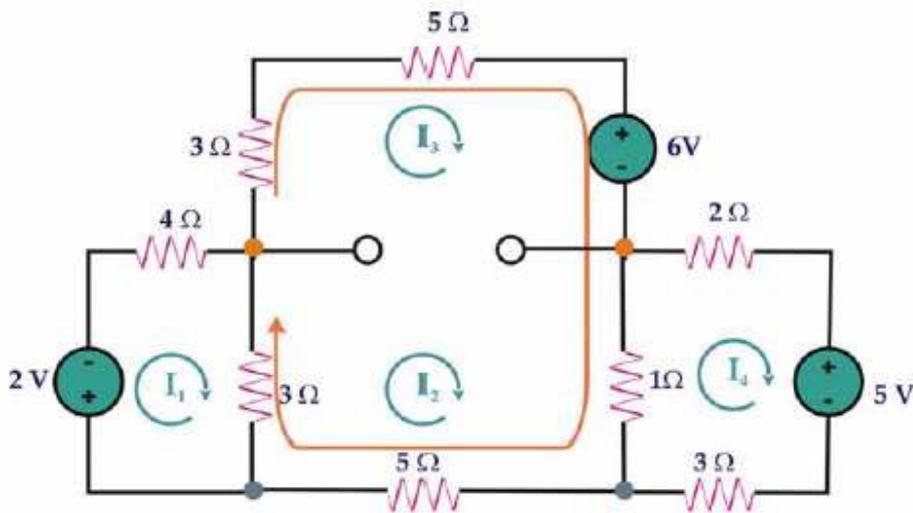
KVL equation for super mesh
1(I2-I4) +8I3+5I2+6+3(I2- I1) =0
Simplifying above equation we get
-3I_1+9I_2+8I_3-I_4= -6…………….. (2)
     KVL equation for Mesh 4
          2I_4 +5+3I_4+1(I_4-I_2) =0
Simplifying we get
-I_2+ 6I_4= -5…………… (3)
Constraint Equation
I_3-I_2=7 ………….. (4)
From Equation (1)
I_1= (3I_2-2)/7
From Equation (3)
I_4= (I_2-5)/6
From Equation (4)
I_3=I_2+7
Putting the values of I_1, I_3, I_4 in equation (2) & simplifying we get
653I_2=-2176
I_2= -3.33A
I1 = - 1.71A
I3 =3.67A
I4 =-1.38A

QUESTION:

Find the power absorbed by the 30kΩ resistor in the circuit below.

Solution:
Writing KVL equation
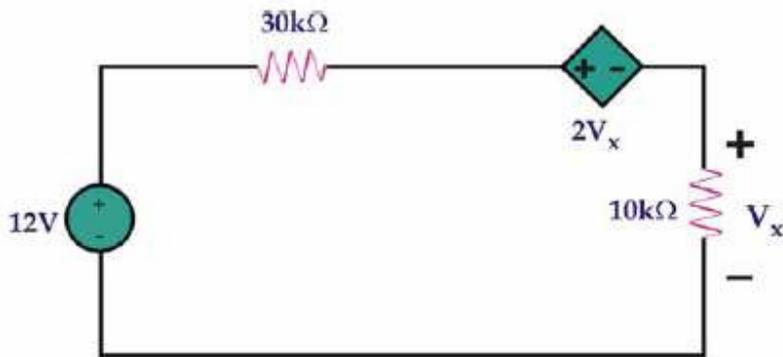-12 -30I + 2Vx+ Vx=0
-12+30Ki+20Ki+10Ki=0
I =200µA
Therefore
P$_{30k}$=I2*R
= (200x 10^{-6})^2*30
= 1.2MW

QUESTION:
(a) Two resistors R$_1$ and R$_2$ of 5Ω each and R$_3$ of 10 Ω are in series. How much is R$_T$. If we applied 80 V source across the series string, how much is the current in R$_3$.
(c) Define Potential difference. What is Conventional Current?

Answer/Solution:
(d) Two resistors R1 and R2 of 5Ω each and R3 of 10 Ω are in series. How much is RT. If we applied 80 V source across the series string, how much is the current in R3.

RT = R1+R2+R3 = 5+5+10 = 20Ω I = VT/RT = 80/ 20 = 4A

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Answer:
(e) Define Potential difference. What is Conventional Current?

Potential difference The potential difference is defined as the amount of work per charge needed to move electric charge from the second point

to the first, or equivalently, the amount of work that unit charge flowing from the first point to the second can perform. In the SI system of units, potential difference, electrical potential and electromotive force are measured in volts, leading to the commonly used term voltage and the symbol V. OR Current flowing in a conductor is due to a potential difference between its ends. Electrons move from a point of less positive potential to more positive potential and the current flows in the opposite direction. The SI unit of potential difference is the volt (V). Volts are the measure of Potential Difference across circuit elements (battery, resistor etc.). Conventional Current The motion of positive charge, in the opposite direction from electron flow, is considered as conventional current. Electricity was known of long before Benjamin Franklin. It was not understood very well, but it was known of. Scientists knew there were two kinds of electric charge. They knew there was electric current. Scientists believed that the opposite charges moved similarly in opposite directions. They defined one as positive and one as negative. They defined current to be in the direction of the positive charges. Later, they learned of their mistake. Only the negative charges move freely in conductors. Electrons had been defined as the negative charges. Current had been defined "backwards". It was too late to redefine all of electrical physics, so the inconvenience holds to this day. The direction that the electrons move is opposite the direction that current points. Because of how electricity works, it isn't much of a problem. Negative charge moving to the left through a wire has the same effect as positive charge moving to the right. So long as the total charge in the wire (protons and electrons) remains balanced, no trouble occurs.

Question: Marks: 2:
An electric heater takes 15A from the 120-V power line. Calculate the amount of power used also mention the
units of derived value.

Solution:
    P=VI
    So,
     P = 120*15 = 1800 = Answer

MID TERM EXAMINATION SEMESTER (Summer 2007) I
PHY- 301 CIRCUIT THEORY

Question:
Why does a person wearing rubber shoes do not get electric shock when touching a naked conducting wire.

Marks=3

Answer:

Rubber is a bad conductor of electricity (it used to be used to insulate wires), but a moderate conductor of heat. Experiment: cover the outside of a soup can with rubber bands, and place it inside a slightly larger can. Put a known amount of ice inside the soup can and see how long it takes to melt. Remove the rubber bands and try it again. Other substances (newspaper, aluminum foil, cardboard) can be used also for comparison.

Phy301-Mid Term
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