
FINALTERM EXAMINATION
Fall 2009
PHY301- Circuit Theory (Session - 2)

Time: 120 min
Marks: 70

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

Charge of 2c and 5c will

- ► attract each other
- ► **repel each other**
- ► no effect
- ► cancel each other

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

Which battery applies a greater potential difference?

- ► **12v**
- ► 1.5v
- ► 10v
- ► 0.5v

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

When one resistance in a series string is open

- ► The current is maximum in the normal resistances.
- ► **The current is zero in all resistances**
- ► The voltage is zero across the open resistance
- ► The current increases in voltage source

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

Addition of impurities in semiconductor material to produce more current is called

- ► **dopping**
- ► bonding
- ► excitation
- ► intrinsic

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

For a P-N junction under farward bias

- ► **more farward current flows**
- ► no farward current flows
- ► more reverse current flows
- ► infinite reverse current flows

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

A diode is a

- ► **one way conductor**
- ► two way conductor
- ► three way conductor
- ► insulator

Question No: 7 (Marks: 1) - Please choose one

In farward biased Characteristics of junction diode, current value is

- ► i=ISe^V/V
- ► **Is=ie^V/VT**
- ► i=Ise^VT/V
- ► i=Ise^V/VT

Question No: 8 (Marks: 1) - Please choose one

The primary and secondary winding of transformer are

- ► physically touched
- ► **physically isolated**
- ► touched with conductor
- ► largely separated

Question No: 9 (Marks: 1) - Please choose one

A certain transformer has 500 turns in the primary winding and 2500 turns in the secondary winding.The turn ratio is

- 0.5
- **25**
- 25v
- 2500

Question No: 10 (Marks: 1) - Please choose one

A transformer will be out of phase when

- output voltage is 0 degree out of phase with input voltage
- **output voltage is 180 degree out of phase with input voltage**
- output voltage is 360 degree out of phase with input voltage
- output voltage is same as input voltage

Question No: 11 (Marks: 1) - Please choose one

If N denotes the total number of nodes, then number of nodal equations in nodal analysis will be

- **Number of equations=N-1**
- Number of equations=N-1/2
- Number of equations=N
- Number of equations=N-2

Question No: 12 (Marks: 1) - Please choose one

Using superposition theorem, for a circuit containing independent sources, any remaining current source is

- replaced by capacitor
- replaced by short circuit
- **made zero by replacing them by open circuit**
- replaced by close circuit

Question No: 13 (Marks: 1) - Please choose one

The PIV of a half wave rectifier circuit with a shunt capacitor filter is

- ► $2V_m$
- ► **V_m**
- ► $V_m/2$
- ► $3V_m$

Question No: 14 (Marks: 1) - Please choose one

The primary function of a filter is to

- ► Minimize ac input variations
- ► Suppress odd harmonics in the rectifier output
- ► **Stabilize dc level of the output voltage**
- ► Remove ripples from the rectified output

Question No: 15 (Marks: 1) - Please choose one

The base region of a p-n-p transistor is

- ► Very thin and heavily doped with holes
- ► **Very thin and heavily doped with electrons**
- ► Very thin and lightly doped with holes
- ► Very thin and lightly doped with electrons

Question No: 16 (Marks: 1) - Please choose one

Voltage multipliers are usually used in low current high voltage applications e.g

- ► Stabilizer of refrigerator
- ► Microcontroller
- ► **Cathode ray tube in television**
- ► Remote control

Question No: 17 (Marks: 1) - Please choose one

The current flow across the base-emitter junction of a p-n-p transistor consists of

- ► Mainly electrons
- ► Equal numbers of holes and electrons
- ► **Mainly holes**
- ► The leakage current

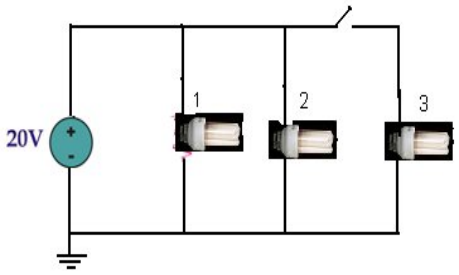
Question No: 18 (Marks: 1) - Please choose one

In an P- type semicondutor material , the majority carriers are

- ► **holes**
- ► electrons
- ► ions
- ► protons

Question No: 19 (Marks: 1) - Please choose one

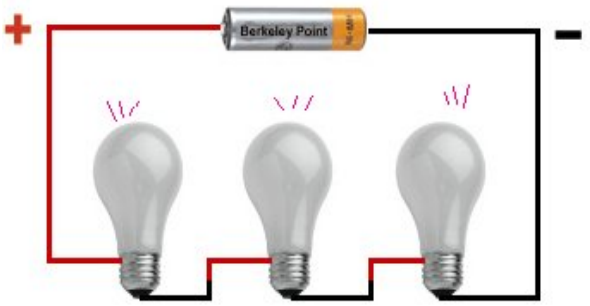
Which light bulb will not glow in given circuit



- ► bulb 1 and 2
- ► all bulbs will not glow
- ► all bulbs will glow
- ► **bulb 3**

Question No: 20 (Marks: 1) - Please choose one

Three bulbs are connected in series of a battery, what would happen if any one bulb is opened.



- ► half of current will flow
- ► same current will flow
- ► **no current will flow**
- ► 2/3 current will flow

Question No: 21 (Marks: 3)

A small light bulb with a resistance of 25Ω is connected across the same 220 volt power line. How much is the current 'I'

Solution:

R=25 Ω
V=220 V
From ohm law
V=IR , I=V/R
So,
I=220/25=8.8 Ampere

Question No: 22 (Marks: 3)

Describe Source Transformation method for simplifying circuit..

Source Transformation:

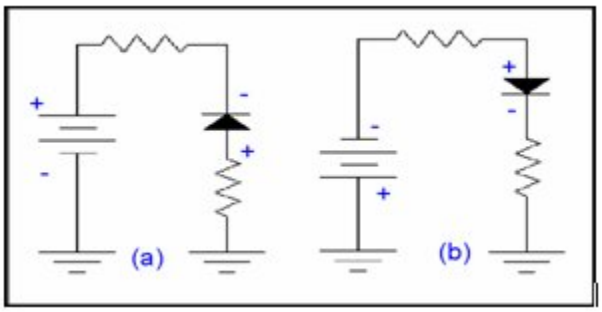
If we have any source embedded within a network, say this source is a current source having a value I & there exists a resistance having a value R, in parallel to it. We can replace it with a voltage source of value V=IR in series with same resistance R.

The reverse is also true that is a voltage source V, in series with a resistance R can be replaced by a current source having a value I= V/R in parallel to the resistance R.

Parameters within circuit, for example an output voltage remain unchanged under these transformations.

Question No: 23 (Marks: 3)

Given below are two figures (a) and (b) having Diode, which diode is forward biased or reversed biased, tell reason.



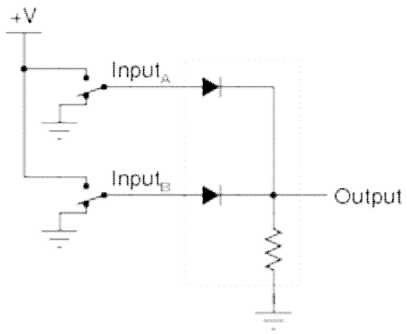
Both A and B are reversed biased

In **fig. a** the negative of the battery is connected to the anode through a resistor and positive terminal of the battery is connected the cathode therefore no current will flow and we can say that diode is not existing and it will act as an open circuit.

In **fig. b** the negative terminal of the battery is connected to the anode through a resistor and positive terminal of the battery is connected the cathode

Question No: 24 (Marks: 3)

Crude logic gates circuits may be constructed out of nothing but diodes and resistors. Take for example this logic gate circuit:



Identify what type of logic function is represented by this gate circuit

This is an OR gate circuit.

Question No: 25 (Marks: 3)

Differentiate between Half wave & Full Wave Rectifier.

Half Wave Rectifier:

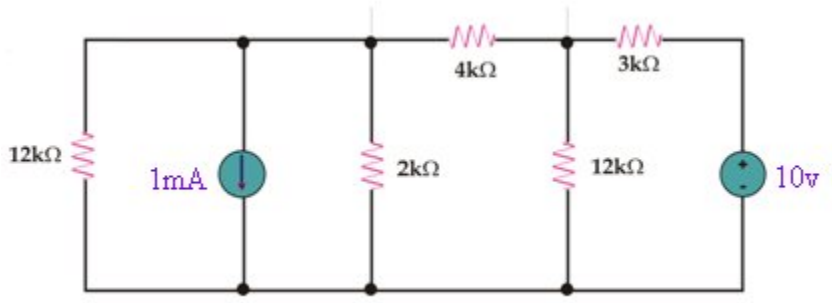
A half wave rectifier is a special case of a clipper. In half wave rectification, either the positive or negative half of the AC wave is passed easily, while the other half is blocked, depending on the polarity of the rectifier. Because only one half of the input waveform reaches the output, it is very inefficient if used for power transfer. Half-wave rectification can be achieved with a single diode in a one phase supply.

Full Wave Rectifier:

A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output. Full-wave rectification converts both polarities of the input waveform to DC (direct current), and is more efficient. However, in a circuit with a non-center tapped transformer, four diodes are required instead of the one needed for half-wave rectification.

Question No: 26 (Marks: 5)

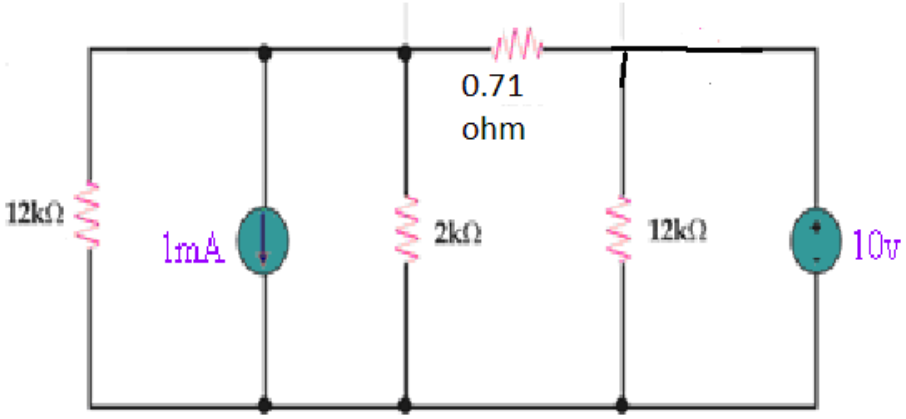
Keeping in mind the **Source transformation method,** how we will convert **10v** voltage source into current source and **1mA** into voltage source in the following circuit, Draw diagrams of converted circuit.

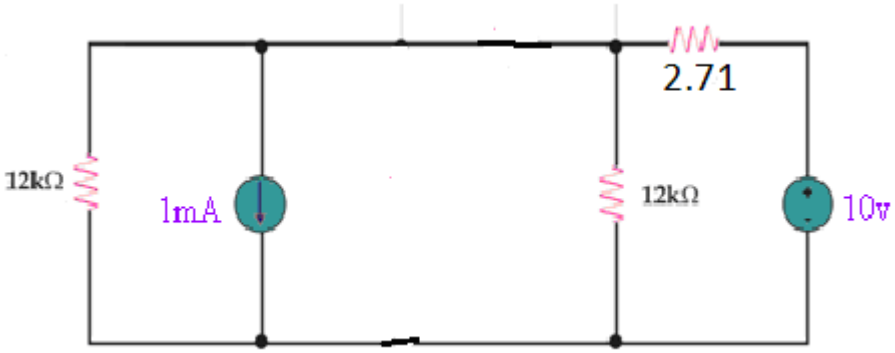


4 is in parallel with 3 so it becomes

4*3/4+3=1.71 ohm

0.71 again in series with 2 to give 2.71 ohm



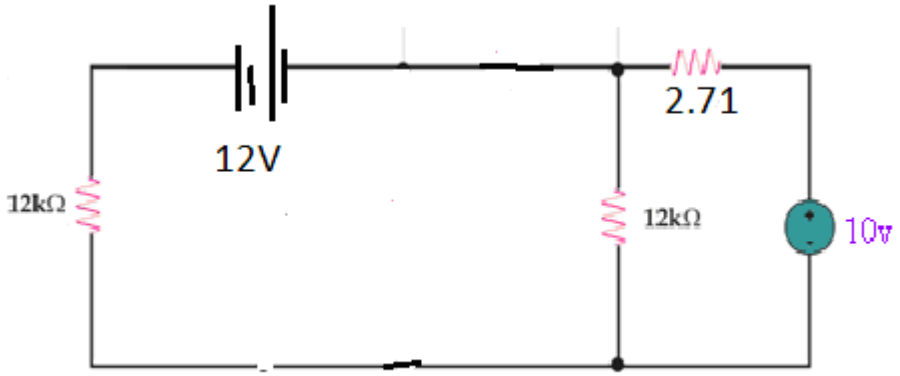


1mA multiply with 12 k by source transformation to give 12 volts

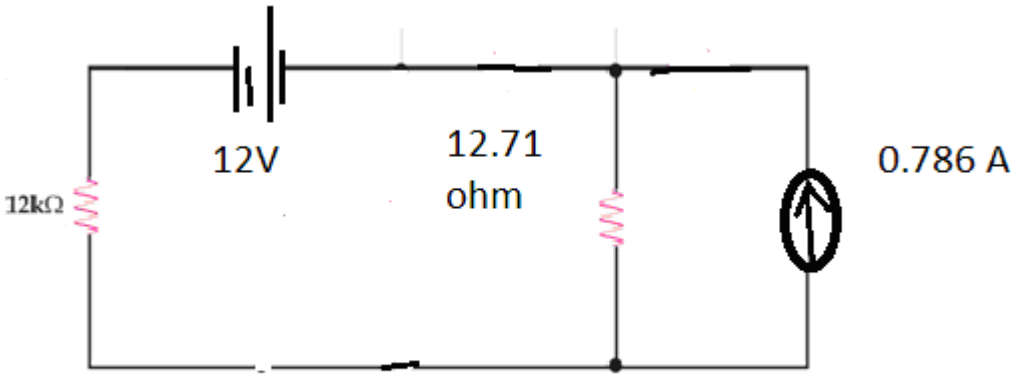
http://vuattach.ning.com

2.71 is in series with 12 to give 12.71.

10 V is in series with 2.71 so, by source transformation



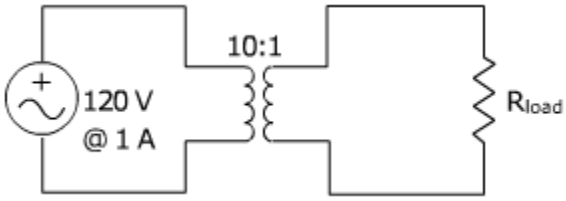
So ,



I= 10/12.71=0.786A

Question No: 27 (Marks: 5)

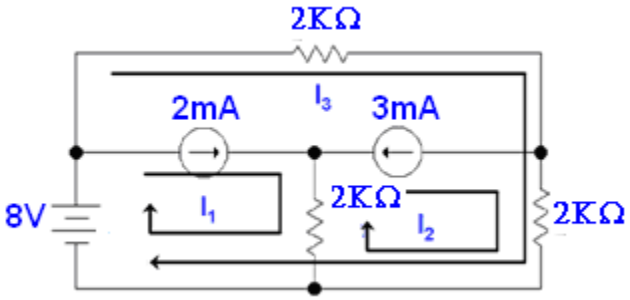
Did the power remain same or not, in either case provide a proof?
http://vuattach.ning.com



The power will not remain same.if primary side is equal to 120V than the secondaryside will be
120/10
=12V

Question No: 28 (Marks: 5)

Calculate I_1, I_2 and I_3 values.

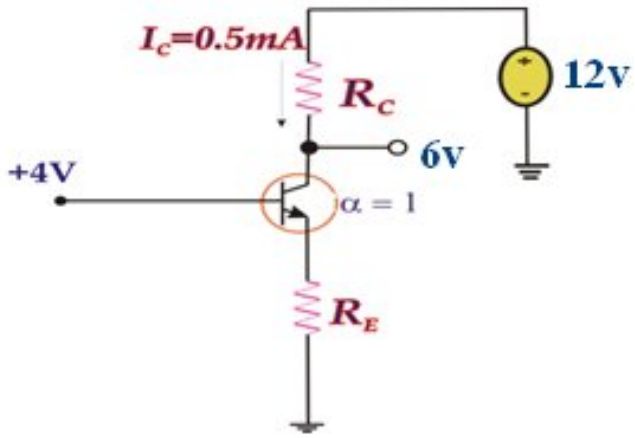


Solution:

I_1=2mA….Ans
I_2=-3mA….Ans
KVL for loop 3
$2kI_3 + 2k(I_3 + I_2) = 8$
$2kI_3 + 2kI_3 + 2kI_2 = 8$
$4kI_3 – 8 = 8$
$4kI_3 = 16$
I_3=4mA….Ans

Question No: 29 (Marks: 5)

For the circuit shown, find I_E & R_C



Question No: 30 (Marks: 5)

A particular diode, for which n=1, is found to conduct 3mA with a junction voltage of 0.7V to 0.8V. Find diode current..

Solution:

$I_d=I_s e\ V_d/nV_t$

If $I_d=3*10^{-3}$ A

when $V_d=0.7$

then

$3*10^{-3}= I_s e0.7/25.2*10^{-3}$

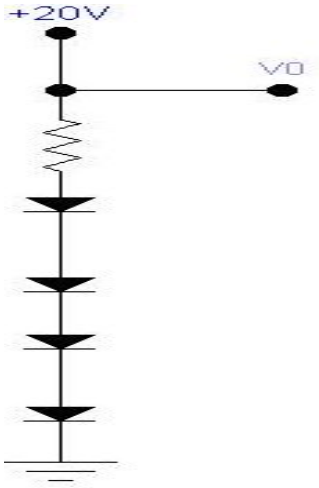
$= I_s=2.5905*10^{-15}$

when $V_d=0.7$ $I_d=4.4619$mA

when $V_d=0.8$ $I_d=0.15868$mA

Question No: 31 (Marks: 10)

Design the circuit in the fig. so that V_0 = 3V when I_L =0, and V_0 changes by 40mV per 1mA of load current .Find the value of R. (assume four diodes are identical) relative to a diode with 0.7v drop at I mA current. Assume n =1



SOLUTION: on next:

V_0 = 3V, when I_L =0, therefore each diode should exhibit a drop of 0.75V. If I_L =1mA, then V_o changes by 40mV and a change due to each diode is 10mV.

Hence

rd = 10mV/1mA =10 Ohms

but

$$rd = nV_T/I_D$$

$$10 = 1 \times 25m/I_D$$

$$I_D = 2.5mA$$

Hence

$$15 - 3 - I_D R_D = 0$$

$$R = (15 - 3)/I_D = (15 - 3)/2.5 = 4.8k \text{ Ohms}$$