ASSIGNMENT-1

-:QUESTION/ANSWERS:-

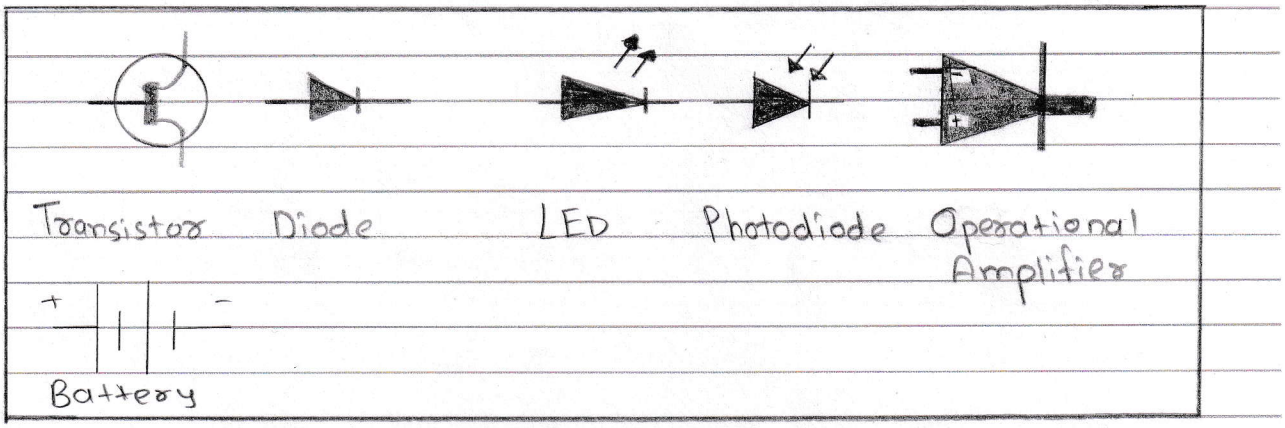
1). What is Active and Passive Electronics Components ? List out Active and Passive components with symbol.

Ans

- Active components are electronic devices that need an external power source to work. They actively control and manipulate the flow of electric current in a circuit. These components can amplify, switch, or generate electrical signals.

- The List of Active electronic components are :

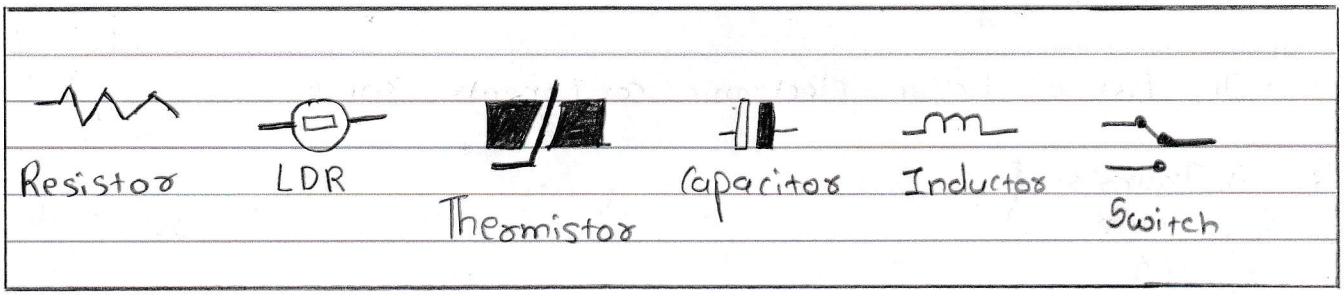
i). Transistor
ii). Diode
iii). LED
iv). Photodiode
v). Integrated circuit (IC)
vi). Operational Amplifier
vii). Seven Segment Display
viii). Battery



- Passive components can be used to connect together within the circuit in a series combination or parallel combination to current flow in complex circuits.

- The list of passive electronic components are :

i). Resistor
ii). LDR
iii). Thermistor
iv). Capacitor
v). Inductor
vi). Switch
vii). Variable resistor
viii). Transformer



2). Explain working / function of Active components with Symbol.

Ans

- An active components works as an altering - current in a device, which works to increase the active power, voltage or current. It is able to do this because it is powered by a source of electricity that is separate from the electrical signal.

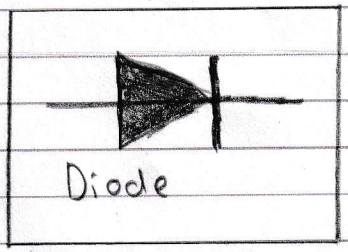
- Working of Active components includes, Active components receive energy in the forms of thermal energy, chemical energy, hydraulic energy, and delivers in the circuit in the form of electrical energy.

- Types of active components are :

i). Diodes
ii). Transistors
iii). Integrated Circuits (ICs)

i). Diodes :-

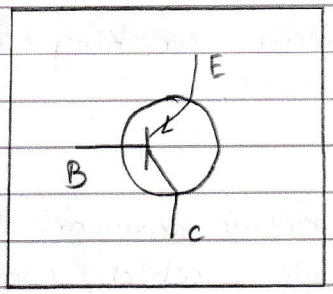
- Diode is a one way valve for electricity. It allow the current to pass through one way if it is forward biased, and it prevents it from passing when it is reverse biased.


Diode

ii). Transistors :-

- Transistors is the most important invention of the last century. It leds to the advancements of electronics

in a large and amazing way. Transistors amplify and switch electronic signals.



iii). Integrated Circuits (ICs) :-

- ICs integrate multiple electronic components into a single package, performing complex functions like microprocessors, memory storage, and specialized circuitry.

3). Explain working / Function of Passive components with symbol.

Ans

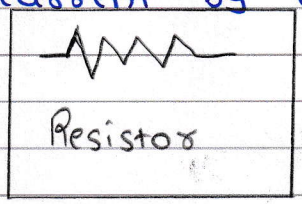
- The circuit element that can only absorb electrical energy and dissipate it in the form of heat or stored in either magnetic field or electric field is known as passive circuit component or passive component.

- The types of passive components are :

i). Resistor
ii). Capacitor
iii). Inductor
iv). Transformer

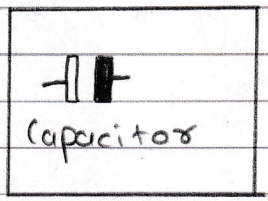
i). Resistor :-

- Resistors control the flow of current by offering resistance. They are used to limit control of current, divide voltage, and set biasing conditions in electronic circuits.



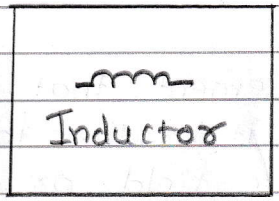
ii). Capacitor :-

- Capacitors store and release electrical energy. They are commonly used for decoupling, filtering, and energy storage in electronic circuits.



iii). Inductors :-

- Inductors store and release energy. They are used for applications such as filtering, energy storage, and impedance matching.



4). What is Ic ? How to identify Pin out of ICs ?

Ans

- An Integrated Circuit (IC) is a small electronic device consisting of multiple components that are integrated together on a single piece of semiconductor material, typically silicon.

- The pinout of an IC refers to the arrangement of its pins and what each pin is used for in a circuit. Here are the key steps to identify the pinout of an IC :

Step-1 : Find Pin 1

- DIP ICs : Pin 1 is marked by a dot, notch, or beveled edge.
- SMD ICs : Pin 1 is indicated by a small dot or printed "1".

Step-2 : Pin Numbering

- DIP ICs : Count pins clockwise from Pin 1.
- SMD ICs : Pin 1 is the reference point, and pins are numbered sequentially around the package.

Step-3 : Common Pin Functions

~~- DIP ICs :~~
- Vcc / VDD : Power supply pin
- GND : Ground pin
- Input pins : For receiving signals
- Output pins : For sending signals

5). What is Breadboard ? Define specifications of Bread board. How are the holes connected in Bread board ?

Ans

- A Breadboard is a tool used for constructing and testing electronic circuits without the need for soldering components together. It provides a simple, reusable platform where components such as resistors, capacitors, and Integrated circuits can be inserted and connected using jumper wires to create a circuit.

- The specifications of Breadboard are :

i). Size : Breadboard come in different sizes based on the number of tie points.

ii). Layout : Breadboard are divided into two main areas : i). Power rails and ii). Terminal strips.

iii). Contacting strips : The rows of holes in the terminal strip are typically 5 holes wide. Components are inserted into these rows, and all holes within a single row are electrically connected.

- The layout of the connection of holes in a breadboard are :

i). Internal Connections For rows :-

- Each row of 5 holes in the terminal strip is connected internally in the breadboard. This means that if you insert a component leg into any of the 5 holes in a row, all the holes are electrically connected together.

6). Write the correct value of following resistor for four band resistor

Ans

i). Brown Black Red No Color

- Brown : First digit = 1
- Black : Second digit = 0
- Red : Multiplier = 10^2
- No color : Tolerance = ± 20 %

Resistor value :

$10 \times 100 = 1000$ ohms $= 1 K\Omega$

ii). Blue Green Orange Silver

- Blue : 6
- Green : 5
- Orange : 10^3
- Silver : ± 10 %

Resistor value :

$65 \times 1000 = 65000\ \Omega = 65\ K\Omega$

iii). White Blue Yellow Gold

- White : 9
- Blue : 6
- Yellow : 10^4
- Gold : ± 5 %

Resistor value :

$96 \times 10000 = 960000\ \Omega = 960\ K\Omega$

ii). Power Rails :-

- The power rails are internally connected along their entire length.

iii). Electrical Isolation :-

- The rows and columns on the breadboard are electrically isolated from each other, meaning that components in one row or column are not automatically connected to those in another.

iv). Column Connections :-

- Some breadboards have internal columns for additional connections, where group of holes are connected together in columns.

7). Write the color code of following resistors for four band resistor.

Ans

i). 4.7 KΩ

- First digit : 4 → Yellow
- Second digit : 7 → violet
- Multiplier : 10^3 → Red
- Tolerance : ± 5% → Gold

Color code : Yellow violet Red Gold

ii). 27 Ω

- First digit : 2 → Red
- Second digit : 7 → violet
- Multiplier : 10^0 → Black
- Tolerance : ± 5% → Gold

Color code : Red violet Black Gold

iii). 1 MΩ

- first digit : 1 → Brown
- Second digit : 0 → Black
- Multiplier : 10^6 → Green
- Tolerance : ± 5% → Gold

Color code : Brown Black Green Gold

8). Write the procedure to test for following electronic components.

i). Diode
ii). Transistor
iii). LED

Ans

i). Diode :-

- A diode allows current to flow in only one direction and blocks current in the reverse direction.

Steps - 1 : Set the multimeter to diode test mode.

Step-2 : Place the multimeter probes across the diode, first with the positive probe on the anode and the negative probe on the cathode.

Step-3 : Reverse the multimeter probes

Result :

a). Good diode : Shows a voltage drop (0.6 - 0.7 V) in forward bias and "OL" in reverse bias.
b). Faulty diode : Shows no reading in forward bias or a reading in both directions.

ii). Transistor :-

- A transistor is a semiconductor device used to amplify or switch electronic signals.

Step - 1 : Set the multimeter to diode test mode.

Step - 2 : Place the positive multimeter probe on the base and the negative probe on the emitter (E). The reading should show 0.6 v to 0.7 v.

Result :

a). Good Transistor : Shows a voltage drop of 0.6v - 0.7v in forward direction between base and emitter.

b). Faulty Transistor : Shows an open loop or inconsistent readings.

iii). LED :-

· An LED emits light when current flows through it in the forward direction.

Step - 1 : Set the multimeter to diode test mode.

Step - 2 : Place the positive probe on the anode and the negative probe on the cathode.

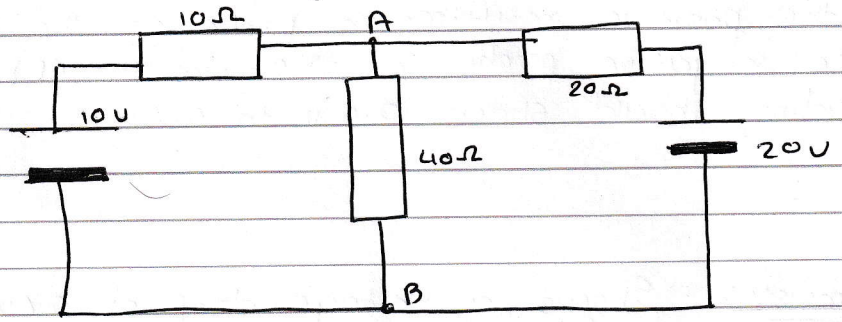
Step - 3 : Reverse the multimeter probes.

Result :

a). Good LED : Shows a voltage drop (1.8v - 3.3v) in forward bias and no reading in reverse bias.

b). Faulty LED : Shows no reading in both directions or lights up in reverse polarity.

9). Find the current through 40 Ω resistor using Kirchoff's voltage law.



Ans

Step-1 : Define Loop Currents

- Let I_1 be the current flowing through the 10Ω and 20Ω resistors in the upper branch.
- Let I_2 be the current flowing through the 40Ω resistor in the lower branch.

$$I_1 = I_2$$

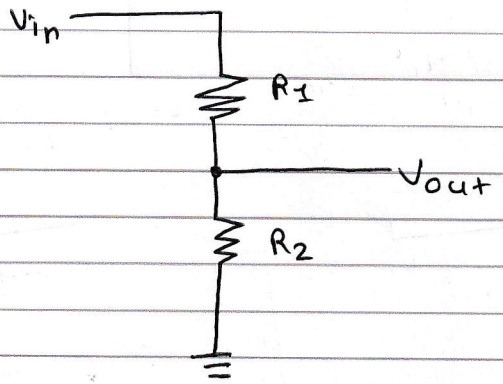
Step-2 : Apply Kirchoff's Voltage Law (KVL)

$$\therefore 10V - (10\Omega \cdot I_1) - (20\Omega \cdot I_1) = 0$$
$$\therefore 10 - 30 I_1 = 0$$
$$\therefore I_1 = \frac{10}{30} = \frac{1}{3} A$$

- The current through the 40Ω resistor is $\frac{1}{3}$ A or approx. 0.333 A

10). Find out the output voltage in given circuit using voltage divider rule if the value of resistors are specified as follow:

a). $R_2 = 0$ (SC)
b). R_2 = Infinite (OC)



Ans

a). $R_2 = 0$

When $R_2 = 0$, the equation becomes:

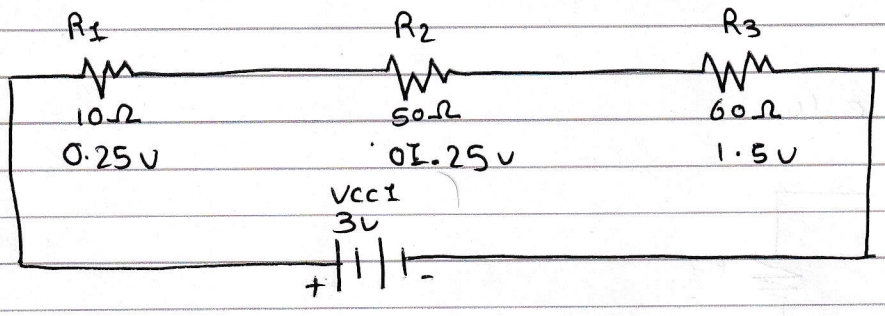
$$V_{out} = V_{in} \times \frac{0}{R_1 + 0}$$

$$= 0V$$

b). $R_2 = \infty$

$$V_{out} = V_{in} \times \frac{\infty}{R_1 + \infty} = V_{in}$$

11). Find out the current flowing in given circuit and voltage drop across each resistor using ohm's law.



Ans

R_1 = 10Ω with 0.25 V
R_2 = 50Ω with 1.25 V
R_3 = 60Ω with 1.5 V

Step-1 : Verify the total Voltage Drop

$$V_{total} = V_{R1} + V_{R2} + V_{R3}$$

$$3V = 0.25V + 1.25V + 1.5V$$

Step-2 : Using Ohm's law

$$I = \frac{V}{R}$$

$$= \frac{V_{R1}}{R_1} = \frac{0.25V}{10\Omega} = 0.025\,A = 25\,mA$$

$$= \frac{VR2}{R2} = \frac{1.25V}{50\Omega} = 0.025A$$

$$= \frac{VR_3}{R_3} = \frac{1.5V}{60\Omega} = 0.025A$$

Result :

i). Current flowing in the circuit :

$I = 25mA \ (0.025A)$

ii). Voltage drop across each resistor :

$R_1 = 10\Omega = 0.25V$
$R_2 = 50\Omega = 1.25V$
$R_3 = 60\Omega = 1.5V$

12). Define the followings :

a). Analog Signal
b). Digital Signal
c). Bit rate and baud rate

Ans

a). Analog Signal :-

- An analog signal is a continous signal that varies over time and can take value within a given range. It represents data using varying voltage, current, or other physical properties.

b). Digital Signal :-

- A digital signal is a discrete signal that represents data using binary values. Unlike analog signals, digital signals have specific levels or steps, making them more resistant to noise and interference.

c). Bit rate and baud rate :-

i). Bit rate :-

- The number of bits transmitted per second in a communication channel.

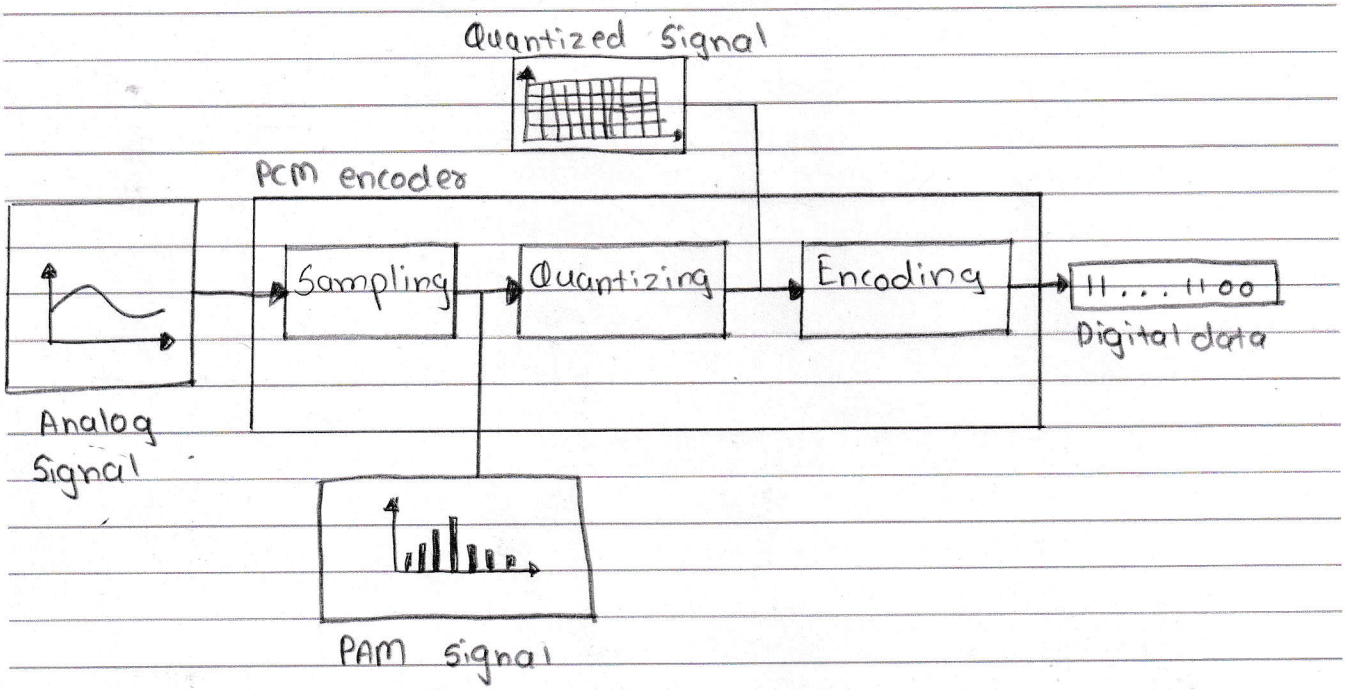
ii). Baud rate :-

- The number of signal changes transmitted per second.

13). Explain the process of Analog-to-Digital conversion with a neat sketch of block diagram.

Ans

- Analog-to-Digital Conversion (ADC) is the process of converting continuous analog signals into discrete digital values that can be processed by digital systems such as computers and microcontrollers.



i). Sampling :-

- The analog signal is sampled at discrete time intervals. The sampling rate must be atleast twice the highest frequency of the signal to avoid loss of information.

ii). Quantization :-

- The sampled values are approximated to the nearest discrete level. The resolution of quantization depends on the number of bits used.

iii). Encoding :-

- The quantized values are converted into binary code. The output is a digital signal in binary format.

14). A television signal with a bandwidth of 4.2 MHz is transmitted using ADC process. The number of quantization level is 512. Calculate

i). Code word length
ii). Minimum sampling frequency

Ans

Given data

Bandwidth (B) = 4.2 MHz
$= 4.2 \times 10^6$ Hz

Number of Quantization Levels (L) = 512

i). Calculate code coord length :-

$L = 2^n$

$n = \log_2 L$

$n = \log_2 (512)$

$n = 9$ bits

ii). Minimum Sampling frequency :-

$f_s \geq 2B$

$B = 4.2 \times 10^6$ Hz

$f_s \geq 2 \times 4.2 \times 10^6$

$f_s \geq 8.4 \times 10^6$ Hz

$= 8.4$ MHz