1. **Define KCL, KVL with formulae?**

A. **Kirchhoff's Current Law (KCL):** states that the sum of currents at a junction point (node) in an electrical circuit is zero

$$\sum I=0$$

Kirchhoff's Voltage Law (KVL): states that the total EMF (electromotive force) of batteries equals the sum of voltage drops across resistances in a closed loop:

$$\sum \text{EMF} = \sum \text{Voltage Drops}$$

2. **Define Voltage division rule ?**

A. The Voltage Division Rule states that in a series circuit, the voltage drop across a resistor is proportional to its resistance. It is given by:

$$Vi = Vtotal \times Rtotal / Ri$$

where Vi is the voltage across the i-th resistor, $Vtotal$ is the total voltage, Ri is the i-th resistor's resistance, and $Rtotal$ is the total series resistance.

3. **Define form factor, peak factor ?**

A. Form Factor:

The form factor is the ratio of the RMS value to the average value of an AC waveform.

$$\text{Form Factor} = Vavg / VRMS$$

Peak Factor

The peak factor (crest factor) is the ratio of the peak value to the RMS value of a waveform.

$$\text{Peak Factor} = \text{VRMS} / \text{Vpeak}$$

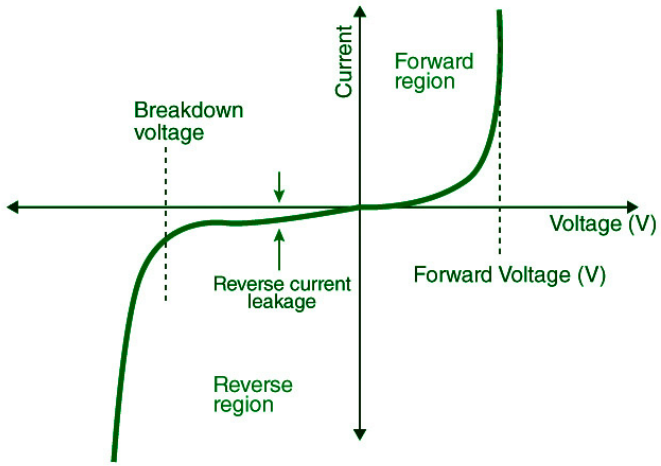
4. **Calculate the total inductnace in a circuit in which L1=5H, L2=10H, L3=25H are connected in series**

A. $Ltotal = L1 + L2 + L3$

L_1=5H L_2=10H L_3=25H

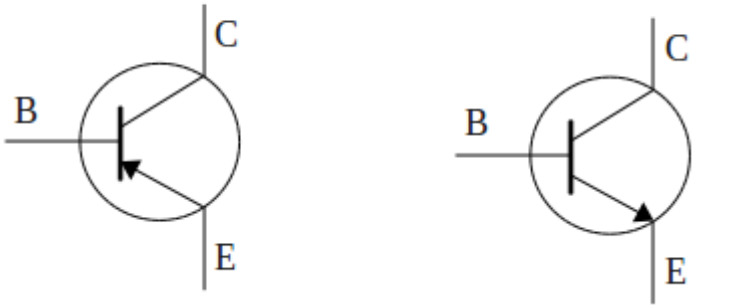
L_{total}= 5H + 10H + 25H = 40H

5. **Draw the VI characteristics of PN junction Diode**



6. **Draw the symbols for PNP and NPN transistor**

Symbol of PNP transistor **Symbol of NPN transistor**



7. **Classify three terminal voltage regulators**

A. **Fixed Voltage Regulators:**

Positive: 78xx series (e.g., 7805 for +5V).

Negative: 79xx series (e.g., 7905 for -5V).

Adjustable Voltage Regulators:

Examples: LM317 (positive), LM337 (negative).

Low Dropout (LDO) Regulators:

Examples: LT3080, LM1117.

8. Mention few applications of OP AMP

1. **Voltage follower**
2. **Selective inversion circuit**
3. **Current-to-voltage converter**
4. **Active rectifier**
5. **Integrators** 6. **Filters**

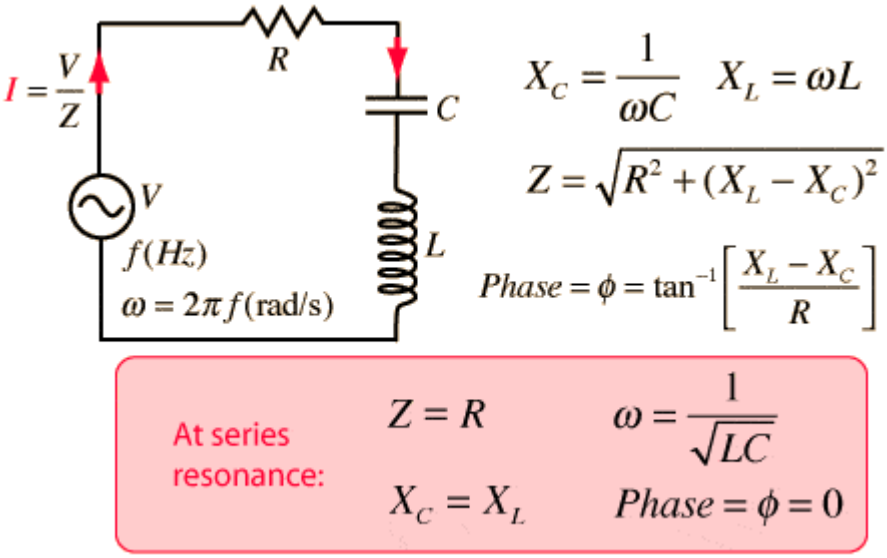
9. Define Branches, loops, nodes ?

A. **Branches:** Two-terminal circuit elements (e.g., resistors, sources)
Loops: Closed paths formed by interconnected branches.
Nodes: Points where two or more branches meet.

10. **Calculate the total inductance in a circuit in which L1=5H, L2=10H, L3=25H are connected in series**

A. Total inductance $Ltotal$=$L$1+$L$2+$L$3 = 5H + 10H + 25H = 40H

11. Draw the series RLC circuit and mention total impedance in the network .

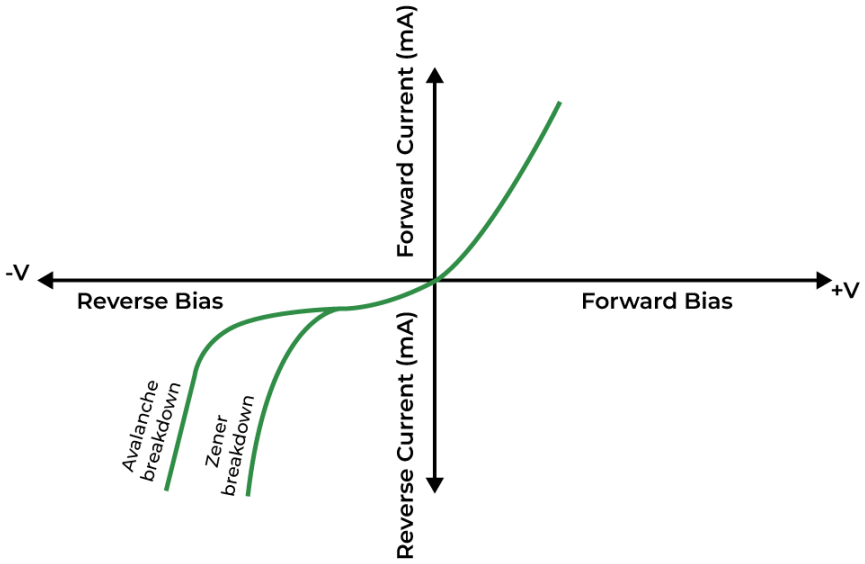


12. Define RMS, average Value in a sinusoidal wave form ?

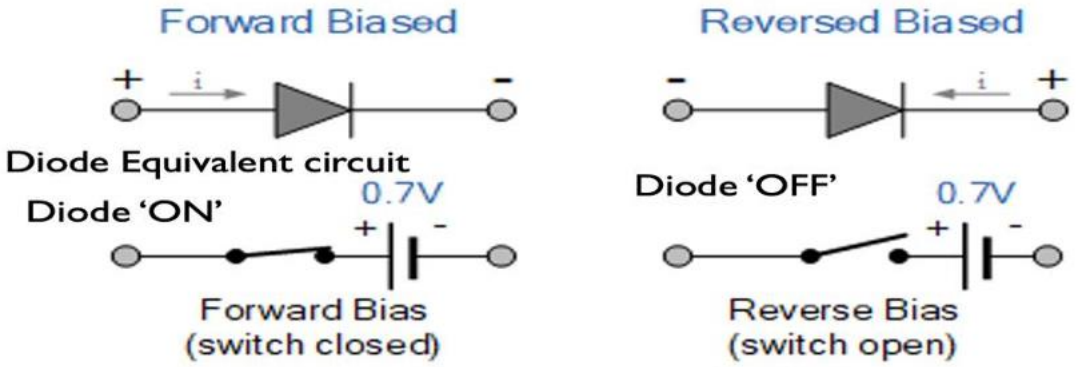
A. RMS (Root Mean Squared) value: is the effective heating value of the wave compared to a steady DC value. It is approximately 0.707 times the peak value.

Average value: is obtained by adding instantaneous values of voltage or current over one-half cycle only.

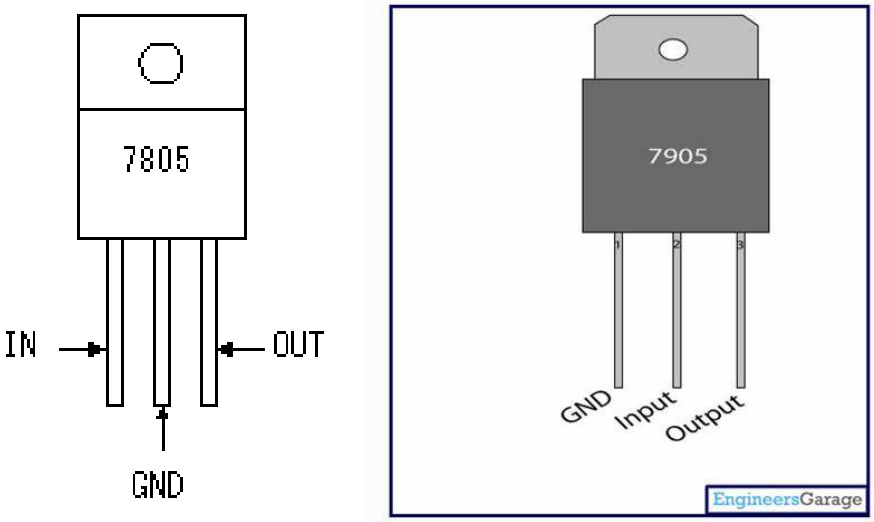
13. Draw the VI characteristics of zener Diode



14. Explain how diode acts as switch with its equivalent circuit ?



15. Draw the pin diagrams of 7805 and 7905 Ics



16. Mention the applications of LM723

- The unnecessary o/p current will be 150mA without using an exterior pass transistor.
- The maximum input supply voltage will be 40V.
- It offers modifiable o/p from 3volts to 37volts.
- These ICs are used to make switching & linear regulator.
- It supplies 10A o/p current with the help of an external pass transistor.
- These ICs are used for different operations such as positive, negative, series, floating, and shunt.

17. Mention the total equivalence inductance in the circuit If two inductors are connected in case i) Series case ii) Parallel

A. i) Series: In series connection, the total inductance (Ltotal) is the sum of the individual inductances ($L1$and $L2$).

$$L\text{total}=L1+L2$$

ii) Parallel: In parallel connection, the reciprocal of the total inductance (Ltotal) is the sum of the reciprocals of the individual inductances ($L1$and $L2$).

$$1 / \text{Ltotal} = 1/ \text{L1} + 1/ \text{L2}$$

18. Calculate the branch currents in the shunt network if R1=R2= 10KΩ, R3=R4=40KΩ powered with a supply of 20V.

$R1=R2=10\text{k}\Omega$

$R3=R4=40\ \text{k}\Omega R3=R4=40\text{k}\Omega$

Supply voltage (Vsupply) = 20V

Using the current division rule, the branch currents can be calculated as follows:

Given that $R1=R2$ and $R3=R4$ we can simplify the formulas:

branch1 =R3 / $2R1+2R3$ × Vsupply/ R1

branch2= R1 / $2R1+2R3$ × Vsupply / R3

Substituting the given values:

Ibranch1= 40k / 100k x 0.2ma = 0.8ma

Ibranch2= 10k /100k x 0.5ma = 0.05ma

19. Define Rectification and ripple factor

Rectification is a process of converting AC in to DC .

The measure of the unwanted pulsating components present in the rectified output is called ripple factor.

- **Ripple factor (γ):** The pulsating components present in the rectifier output are ripples and measure of such ripples present in the output is known as ripple factor.

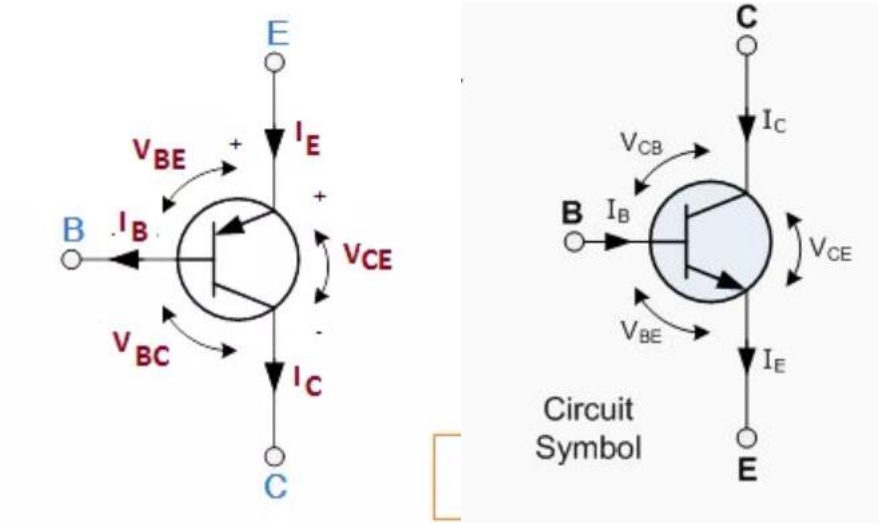
$$\gamma = \sqrt{\left(\frac{I_{RMS}}{I_{DC}}\right)^2 - 1}$$

Now for a half wave circuit,

$$I_{RMS} = \frac{I_m}{2} \qquad I_{DC} = \frac{I_m}{\pi} \qquad \gamma = 1.211$$

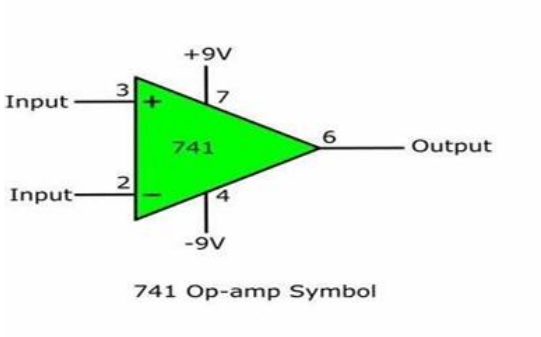
This indicates that the ripple content in the output are 1.211 times the dc component. i.e 121.1% of the dc component.

20. Illustrate the PNP & NPN Transistors with terminal voltages and currents



PNP **NPN**

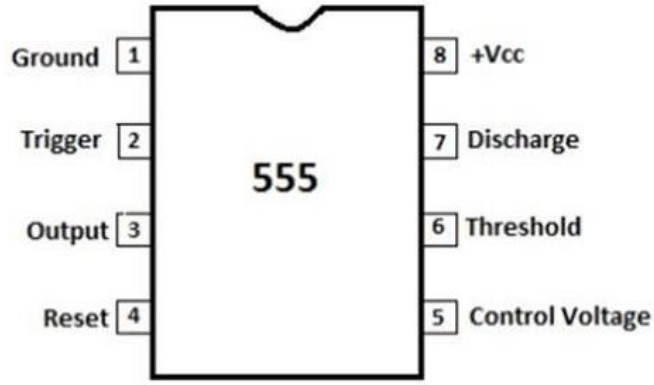
21. Draw the symbol of OP- AMP IC 741 with input and out put pins



741 Op-amp Symbol

22. Describe the IC 555 with its pin configuration

A)



Pin no	pin description	Purpose
1	Ground	Ground reference voltage, low level (0 V)
2	Trigger	This output is driven to approximately 1.7 V below +Vcc, or GND
3	output	This output is driven to approximately 1.7 V below +Vcc or GND.
4	Reset	A timing interval may be reset by driving this input to GND, but the timing does not begin again until RESET rises above approximately 0.7 volts. Overrides TRIG which overrides threshold.
5	Control voltage	Provides "control" access to the internal voltage divider (by default, 2/3 Vcc).
6	Threshold	The timing (OUT high) interval ends when the voltage at the threshold is greater than that at CTRL (2/3 Vcc if CTRL is open).
7	Discharge	Open collector output which may discharge a capacitor between intervals. In phase with output.
8	VCC	Positive supply voltage, which is usually between 3 and 15 V depending on the variation.

23**. State maximum power transfer theorem?**

A. The Maximum Power Transfer Theorem states that for maximum power transfer from a source to a load, the load resistance should be equal to the internal resistance of the source.

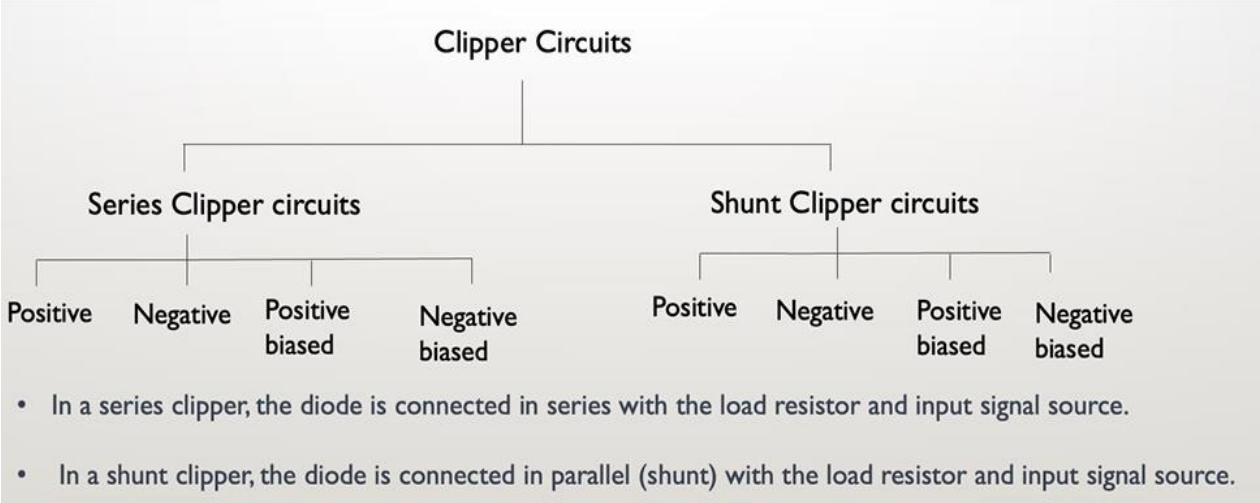
24. Define reactive power, real power

Reactive power (Q): is the exchange of energy stored and released by reactive elements in an AC circuit, measured in volt-amperes reactive (VAR).

Real power (P): is the actual power consumed or dissipated in a circuit, measured in watts (W).

25. Mention different types of clippers and clamper circuits

A.



26. **Define slew rate, CMRR**

A.

Slew Rate: slew rate is by dividing the change in output voltage by the change in time, illustrating how quickly the output voltage can change.

$$S = \frac{dV_0}{dt}|_{maximum} = \omega V_m$$

CMRR: (Common Mode Rejection Ratio):
It's a measure of how well an amplifier can ignore OR Rejects the same signal that appears on both inputs.

CMRR can be defined as the ratio of the differential gain (A_D) to the common-mode gain (Acm)