ELECTRONICS ENGINEERING

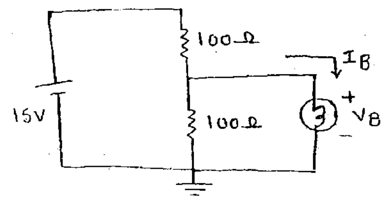
ACE ACADEMY

Topper Handwritten Notes

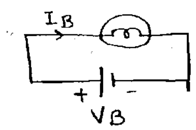
ANALOG ELECTRONICS

Approach to start Analog:

Find the current through the Light bulb and voltage across bulb

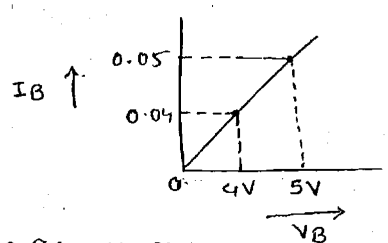


Step 1 : Treat the Bulb as a Black box [lumped]



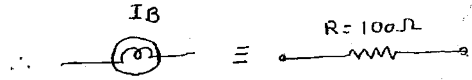
V_B	I_B
5V	0.05
6V	0.06
7V	0.07
4V	0.04

Step 2 : Draw the characteristics of the bulb:

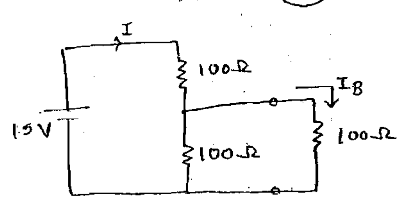


Step 3: $y = mx$

$I_B = (\ \ ) V_B \rightarrow \frac{V_B}{I_B} = 100\Omega$ = resistor

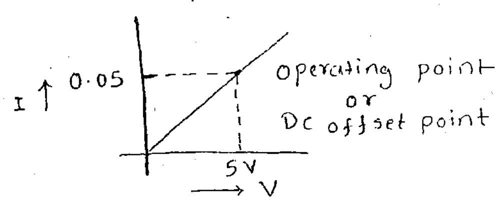


Step 4:



$I = \frac{15}{100 + 100 || 100} = 100mA$

$I_B = \frac{I}{2} = 50mA$

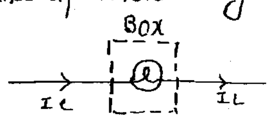


Note: In analog we deal with devices with peculiar V-I characteristic

1) Resistor (I is proportional to V)
2) Capacitor (I is proportional of rate of change of V)
3) Diode (I flows in one direction)
4) Thermistor (Temperature dependent resistor)
5) Photoresistor (Light dependent resistor).

* Lumped Circuit Constraints :

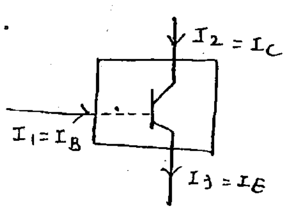
1) Choose the element boundaries in such a fashion that the rate of charge build up inside any device is zero for all time.



$$I_e - I_L = \frac{dq}{dt} = 0$$

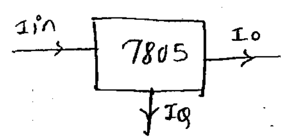
$$\therefore I_e = I_L \quad \text{(KCL)}$$

e.g.



$I_3 = I_1 + I_2$

$I_E = I_B + I_C$

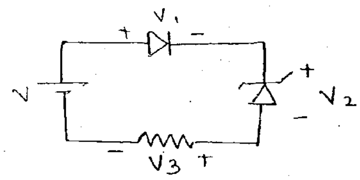


$I_{in} = I_Q + I_o$

The idea behind this constrain is we alot a unique value of current entering & current leaving the terminos & not interested in the charge build up or depletion within the element.

2] Choose the element boundaries in such a fashion that the rate of change of flux outside the element in any close path is zero for all time.

The idea behind this constraint is we alot a unique value of voltage and that voltage does not change with time or path taken.



$$-V + V_1 + V_2 + V_3 = 0$$

$$\rightarrow \boxed{V = V_1 + V_2 + V_3} \quad \text{(KVL)}$$

3] The time scale of the input signal is much larger than the ~~progatio~~ propogation delay of elements used.

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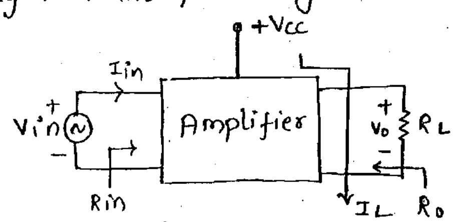
* AMPLIFIER MODELLING *

Definition :-

An amplifier is a device which improves a strength of a signal. Strength means power gain.



Voltage gain $(A_V) = \frac{V_o}{V_{in}}$

Current gain $(A_I) = \frac{I_L}{I_{in}}$

Power gain $(A_p) = A_V \cdot A_I$

$Gain_{db} = 10 \log A_p$

$A_{V db} = 20 \log A_V$