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Subject Basic Electronics
Department BS(CS)
Semester 4^{th}

Q (1)

part (a)

$$I_s = \frac{24\,V}{470\,\Omega}$$

51.06 mA

special purpose diode..

since the load voltage is 15

$$I_L = \frac{15V}{1.5K\Omega}$$

$$I_L = 10\,mA$$

The zener current is the diff between two current.

$$I_z = 51.06\,mA - 10\,mA$$

$$\boxed{I_z = 41.06\,mA}$$

Part (b)

Load Resistance $R_L = 1500\,\Omega$

Input current $= E_i = 24$

Resistance $= R = 470\,\Omega$

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Load voltage = V_L = ?

Solution:-

As we know that

$$V_L = \frac{R_L E_i}{R + R_L}$$

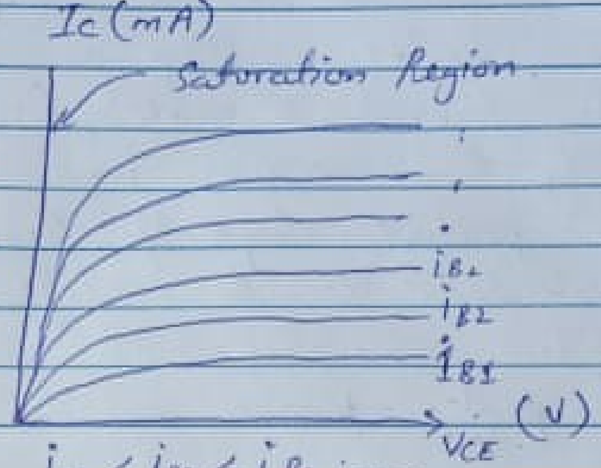
putting values.

$$\Rightarrow V_L = \frac{1500 \times 24}{470 + 1500}$$

$$\Rightarrow V_L = \frac{36000}{1970}$$

$$\boxed{V_L = 18.27V}$$

Q (2)



$i_{B1} < i_{B2} < i_{B3}$; ...

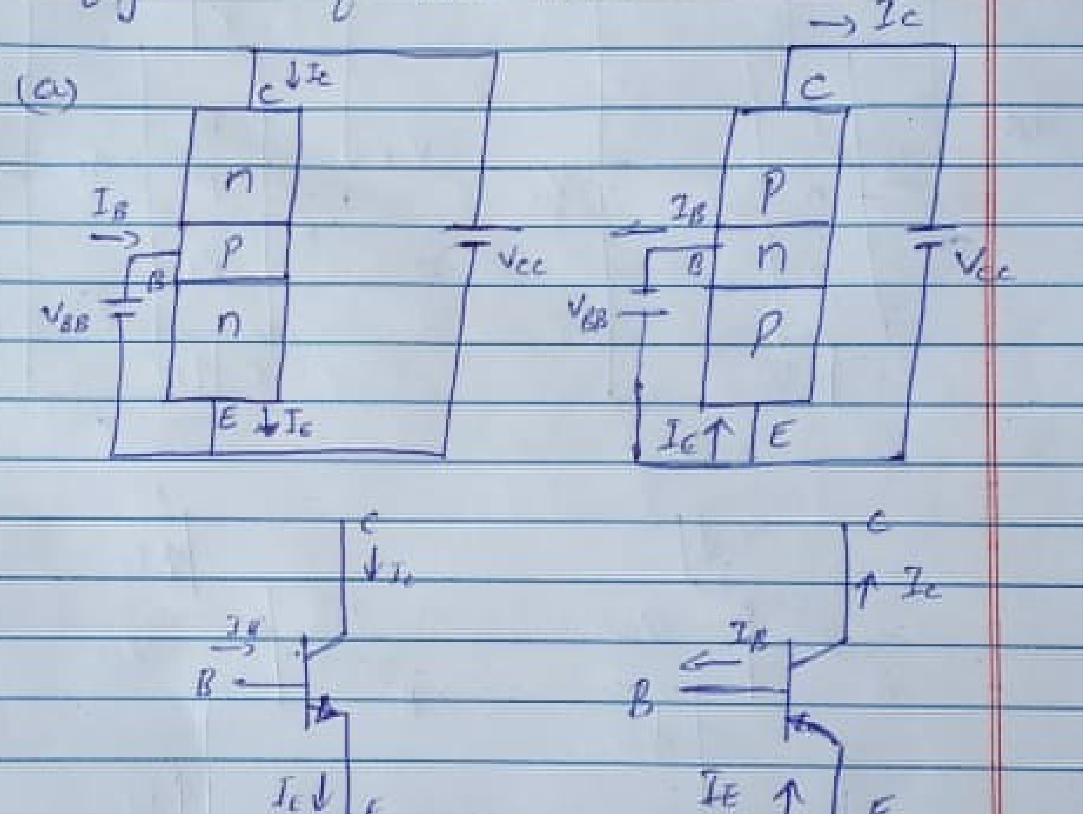
- As the magnitude of Vce decreases, there comes a point when the collector voltage becomes less than the base voltage. When this happens, the transistor leaves the linear region of operation and enters the saturation region, which is highly non-linear and is not usable for amplification.
- The cutoff region of operation occurs for base currents near zero. In the cutoff region, the collector current approaches zero in a nonlinear manner and is also avoided for amplification applications.
- The linear region is where we want to be for amplification. In the linear (or active) region the curves would ideally be

horizontal straight lines, indicating that the collector behaves as a constant current source independent of the collector voltage, as illustrated in the hybrid - π model ($i_c = \beta i_B$). Practically, these curves have a slight positive slope. If these curves are extended to the left along the $-V_{CE}$ axis, they will converge to a point known as the Early voltage.

Q (3)

(1) Common emitter.

When the emitter terminal is common to both the input and the output circuits, the mode of operation is called the common emitter or the ground emitter configuration of the transistor.



(n-p-n transistor)   (p-n-p) transistor)

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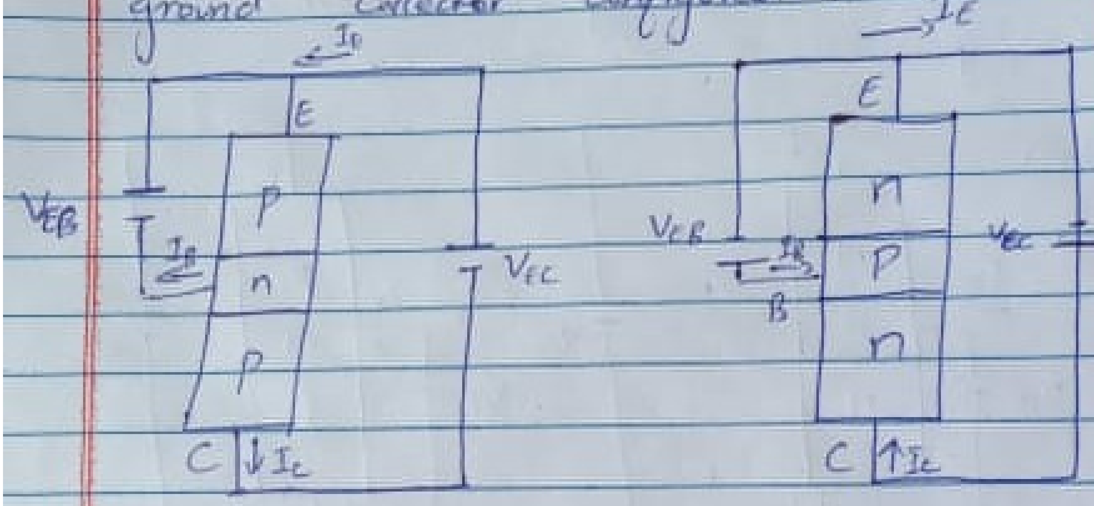
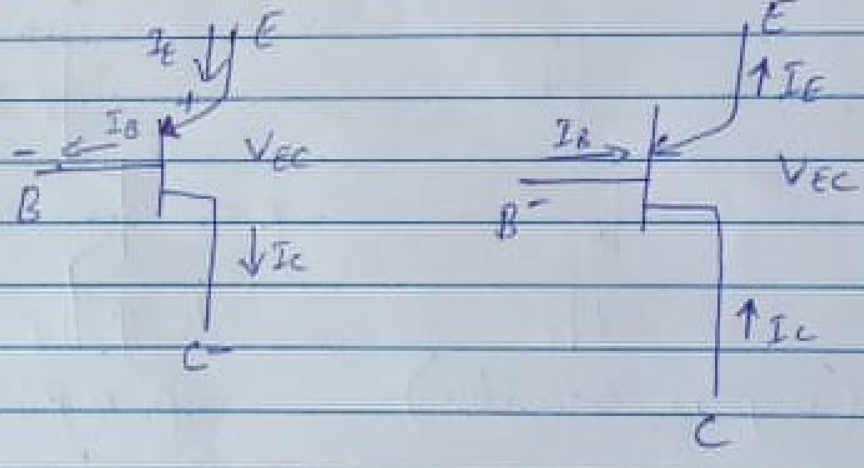
(2) Common Collector:-

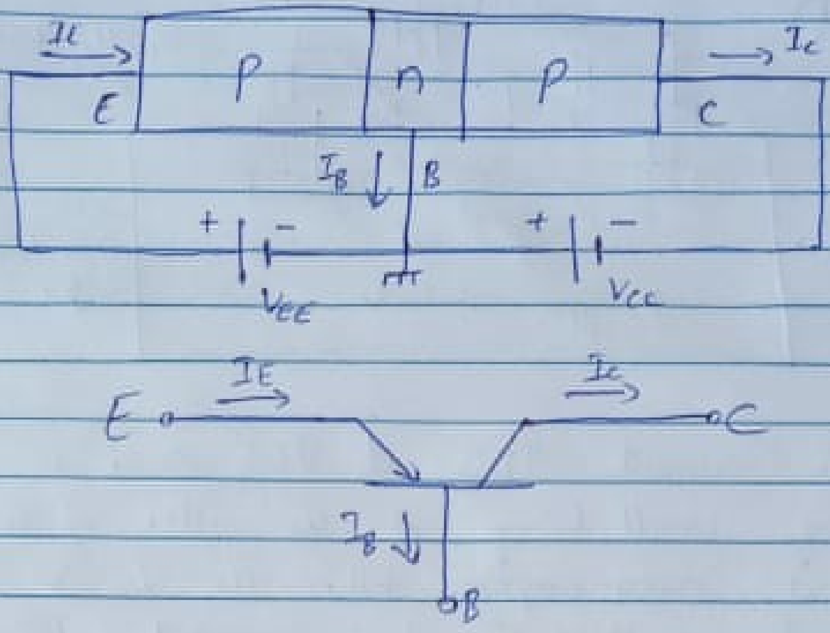
When the collector terminal of the transistor is common to both the input and the output terminals, the mode of operation is known as the common collector mode or the ground collector configuration.



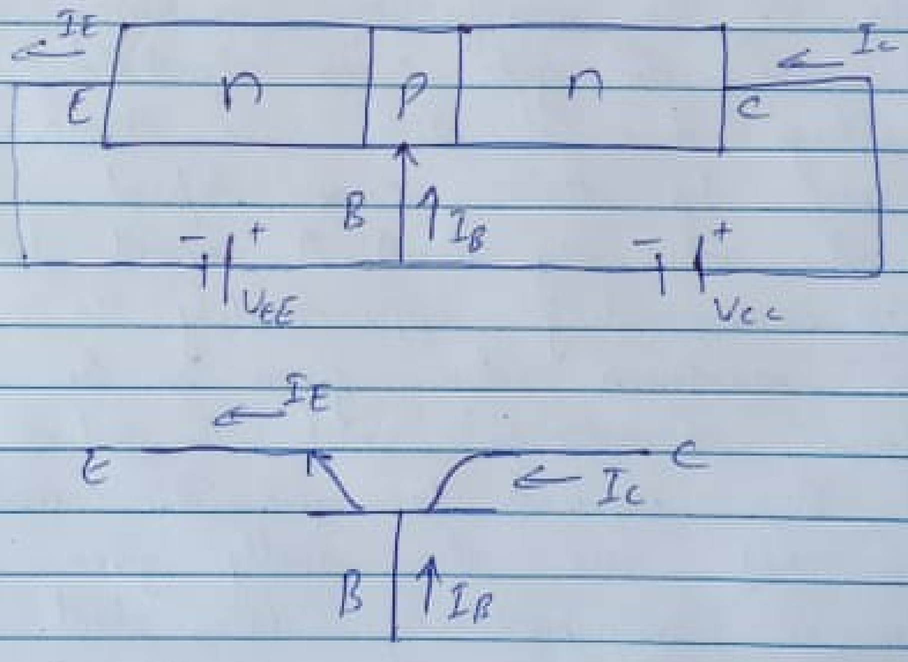


c) Common Base:-

In This mode, the base terminal is common to both the input and the output circuits. This mode is also referred to as the ground base configuration.

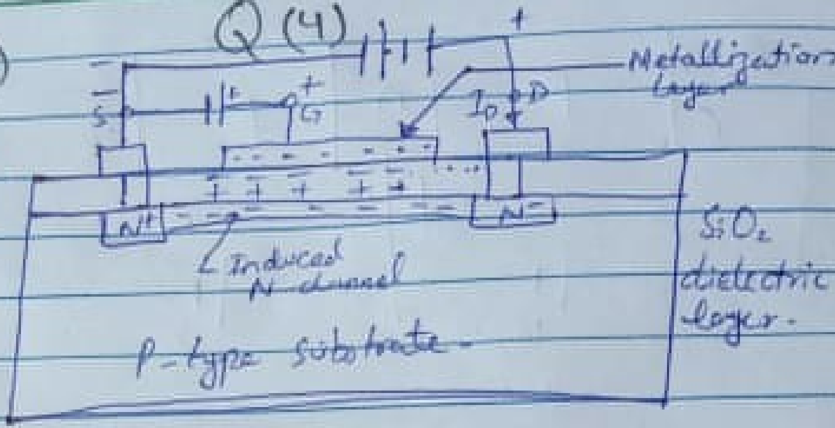


(p-n-p transistor)



n-p-n transistor-

Q(4)



The current IDSS at VGS <= 0 is very small, being of the order of a few nano-amperes. When the V_{GS} is made positive, the drain current I_D increases slowly at first, and then much more rapidly with an increase in V_{GS}. The manufacturer sometimes indicates the gate-source threshold voltage V_{GST} at which the drain current I_D attains some defined small value, say 10 uA. A current I_D(ON), corresponding approximately to the maximum value given on the drain characteristics and the values of V_{GS} required to give this current V_{GS} ON are also usually given on the manufacturers data sheet.

For zero value of V_{GS}, the E-MOSFET is OFF because there is no conducting channel between source and drain. Each of schematic symbols has broken channel line to indicate this normally OFF condition. As we know that for V_{GS} exceeding the threshold voltage V_{GST}, an N-type inversion layer, connecting the source to drain, is created.

Q (5)
part (a)

Advantages & Disadvantages of BJT

Advantages	Disadvantages
* They have a better voltage gain.	* BJT has a low thermal stability.
* They have a high current density.	* BJT is most effective by radiation.
* They have a low forward voltage.	* BJT has more noise produced.
* BJT shows better performance at high frequency	* The switching time is not very fast compared to a high alternating frequency of current and voltage.

Advantage & Disadvantage of FET

Advantages	Disadvantages
* FET has a high input impedance of several megaohms	* They are more costly than junction transistor.
* FET has less effect by radiation than BJT.	* It has lower switching time compare to BJT.
* Less noise than compare to BJT.	* Transconductance is low hence voltage gain is low.
* They have better thermal stability.	* Smaller gain bandwidth product compare to BJT.

Q (5)
part (b)

Answer:-
When the drain voltage is increased, the positive drain potential opposes the gate voltage bias and reduces the surface potential in the channel. The channel inversion layer change decreases with increasing drain source voltage and ultimately, it becomes zero when the drain source voltage equals to $(V_{GS} - V_{GS(th)})$. This point is called the channel pinch-off voltage where the drain current becomes saturated.