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ES - II (Assignment - 2)

Q.1. $\rho = \frac{1}{\sigma} = \frac{1}{qn\mu_n} = \frac{1}{1.6\times10^{-19}\times10^{17}\times 800}$

$= 0.078 = 0.08\ \Omega cm$.

Q.2. Clipper Circuits are the Circuits that clip off or removes a portion of an input signal, without Causing any ~~distribution~~ distortion to the remaining part of the wave form.
Clippers are basically wave-shaping Circuits that Control the Shape of an output waveform.
clippers circuit are basically termed as protection devices

Classification of clipper Circuit
→ Positive Clipper Circuit
→ Negative clipper Circuit

The Clipper circuit that is inteded to attenuate positive portions of the input signal can be termed as a positive clipper.
We have following types :
- Positive Series clipper :-
  - positive series clipper with positive V_r (Reference Voltage)
  - positive series clipper with negative V_r
- Positive Shunt clipper :-
  - positive shunt clipper with positive V_r
  - positive shunt Clipper with negative V_r

The clipper circuit that is intended to attenuate negative portions of the input signal can be termed as negative clipper.

- Negative series clipper :-
  - Negative series clipper with positive V_r
  - Negative series " " negative V_r
- Negative shunt clipper :-
  - Negative shunt clipper with positive V_r
  - " " " with negative V_r

Clamper Circuit :

A Clamper circuit can be defined as the circuit that consist of a diode a resistor & a capacitor that shifts the waveforms to a desired DC level without changing the actual appearance of the applied signal.

In a clamper circuit, a vertical shift of upward or downward takes place in the output waveform.

There are few types of Clamper Circuit.

- positive clamper
  - positive clamper with positive V_r
  - " " " negative V_r
- Negative clamper
  - Negative clamper with positive V_r
  - " " " negative V_r

Q.3. The configuration in which the emitter is connected between the collector & base is known as a common emitter configuration (CE)

→ Input characterstic : The variation of emitter current (I_B) with Base - emitter voltage (V_{BE}) keeping collector emitter voltage (V_{CE}) constant.

$$R_{in} = \left.\frac{\Delta V_{BE}}{\Delta I_B}\right|_{V_{CE} = \text{constant}}$$

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→ Output characterstics : The variation of Collector current (I_C) with Collector-Emitter Voltage (V_{CE}) keeping the base current (I_B) constant.

$$R_{out} = \left.\frac{\Delta V_{CE}}{\Delta I_C}\right|_{I_B = \text{constant}}$$

In CB Configuration, the Base terminal of the transistor will be connected common between the output and the input terminals (CB)

→ Input characterstics : The Variation of emitter current (I_E) with Base-Emitter Voltage (V_{BE}), keeping collector base voltage (V_B) constant.

$$R_{in} = \left.\frac{\Delta V_{BE}}{\Delta I_E}\right|_{V_{CB} = \text{constant}}$$

→ Output characterstics : The variation of Collector current (I_C) with Collector-Base voltage (V_{CB}). Keeping the emitter current (I_E) constant.

$$R_{out} = \left.\frac{\Delta V_{CB}}{\Delta I_B}\right|_{I_E = \text{constant}}$$

In CE Configuration, the Collector terminal of the transistor will be connected common between the output & the input terminal.

→ Input characterstics : The Variation of emitter current (I_B) with Collector-Base Voltage (V_{CB}), Keeping Collector Base voltage (V_{CE}) constant

→ Output characterstics : The Variation of emitter current (I_E) with collector-Emitter voltage (V_{CE}), Keeping the base current (I_B) constant.

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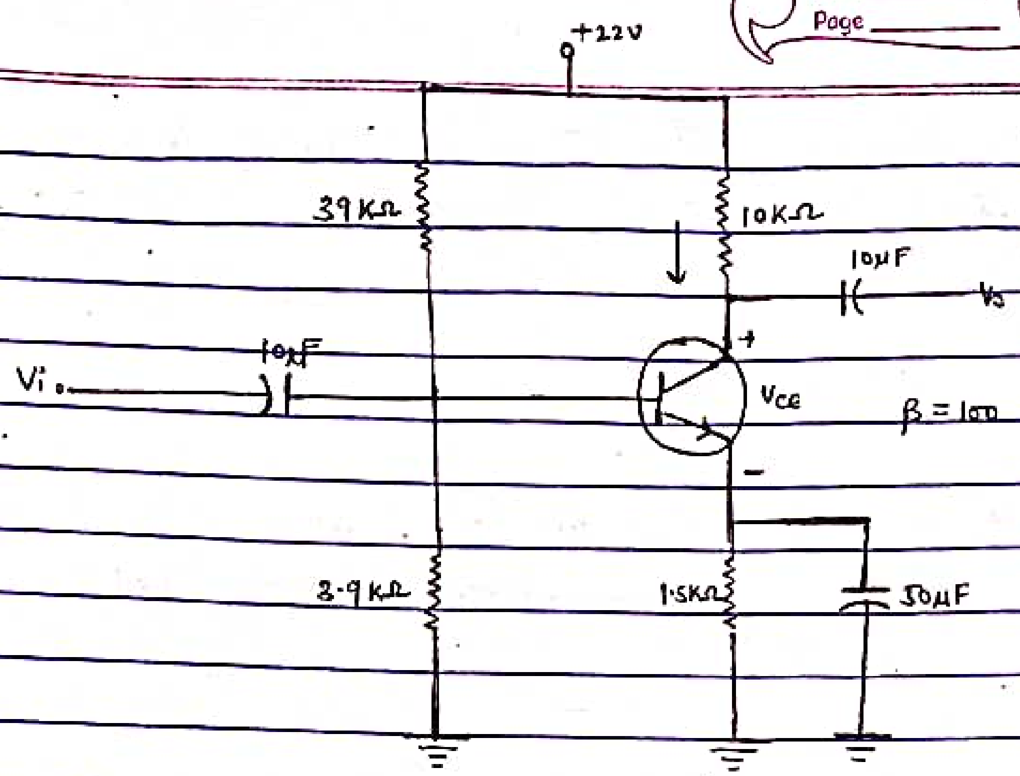
Q.4.



$$R_{th} = R_1 \parallel R_2 = \frac{(39K\Omega)(3.9K\Omega)}{(39K\Omega + 3.9K\Omega)} = 3.55K\Omega$$

$$E_{th} = \frac{R_2 V_{cc}}{R_1 + R_2} = \frac{(3.9K\Omega)\,22V}{39K\Omega + 3.9K\Omega} = 2V$$

$$I_B = \frac{E_{th} - V_{BE}}{R_{th} + (\beta+1)R_E} = \frac{2 - 0.7V}{3.55 + 101 \times 1.5}$$

$$= \frac{1.3}{3.55 + 151.5} = 8.38\ \mu A$$

$$I_c = 100 \times 8.38 = 0.838\ mA$$

$$V_{CE} = V_{cc} - I_c(R_c + R_E) = 22 - (0.838)(10 + 1.5)$$

$$= 22 - 9.63 = 12.37V$$ ✓