

## Assignment -2

**Note: Write answers for any TEN questions**

Que 1. Draw the symbol of NPN and PNP transistors. What is the significance of the arrow in this symbol.

Que 2. (i) Define  $\beta$ . Show that :

$$\beta = \alpha / 1 - \alpha$$

(ii) why is the collector is wider than emitter and base in a transistor.

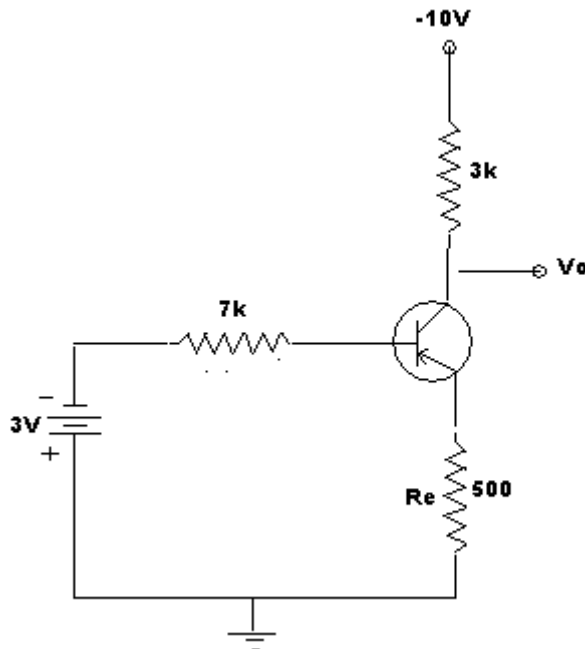
Que 3. Draw input and output characteristics of transistor in a CE configuration. Show the

different regions of operation. What are biasing requirement for the transistor to operate in this regions.

Que 4. Explain qualitatively the three consequences of base width modulation and also explain the base width modulation.

Que 5. For the circuit shown assume  $\beta = h_{FE} = 100$

- (i) Find if the si transistor is in cut-off ,saturation or in active region.
- (ii) Find  $V_o$ .
- (iii) Find the minimum value for the emitter resistor  $R_e$ .



Que 6: Draw the circuit diagram of common emitter amplifier with emitter bias and derive an expression for stability factor.

Que 7: Design the voltage divider bias circuit to have  $V_{CC}=12V$ ,  $V_{CE}=5V$  and  $I_C=3\text{ mA}$ . Assume Si transistor with  $\beta=100$ .

Que 8: Explain the diode compensation circuit for compensation of  $V_{BE}$ .

Que 9: A silicon npn transistor with  $h_{FE}=100$ ,  $R_C=3K$ ,  $R_B=50K$ ,  $V_{BB}=5V$  and  $V_{CC}=10V$ .

i) Construct the circuit

ii) Find whether or not transistor is in saturation region.

iii) Repeat the part ii) with  $R_E=2K$  added in the circuit.

Que 10: Explain the diode compensation circuit for compensation of  $I_{CO}$ .

Que 11: Explain the difference between enhancement mode and depletion mode MOSFET

Que 12: For a p-channel silicon FET with  $a=2 \times 10^{-4}\text{ cm}$  & channel resistivity =  $10\text{ ohm cm}$ : (a) Find Pinch off voltage.

Repeat part (a) for Germanium FET with resistivity =  $2\text{ ohm cm}$ .

Que 13: If magnitude of  $I_{DSS}=4\text{mA}$ ,  $V_p=4V$ , calculate the quiescent values of  $I_D$ ,  $V_{GS}$  &  $V_{DS}$ .

Que 14: The drain current in mA of the enhancement-type MOSFET shown is given by:

$$I_D = 0.2 (V_{GS} - V_P)^2 \text{ in the region } V_{DS} \geq V_{GS} - V_P.$$

If  $V_P = +3V$ , Calculate the quiescent values  $I_D$ ,  $V_{GS}$  &  $V_{DS}$ .

Que 15: Sketch transfer characteristics of JFET and show that;

$$G_m = g_{m0} [1 - V_{GS}/V_P]$$

$$= g_{m0} \sqrt{I_D} / I_{DSS}$$

Que 16: Bring out a neat comparison between JFET and MOSFET