

Course: PH209

1.

- a) The width of base of a transistor should not be too thick and should not be too thin: Justify this statement [Marks 2]
- b) What is Early effect? How does it affect the output characteristic of a transistor? [Marks 2+3]
- c) What is the main advantage and disadvantage of a class A amplifier, and how does a class B amplifier solve the main disadvantage of a class A amplifier? [Marks 2+2]

2. a) If $\alpha = 0.98$, and the transistor is operating in the active region, find the value of the resistance R_1 for which the emitter current is $I_E = 2$ mA. Neglect the reverse saturation current. [Marks 3]

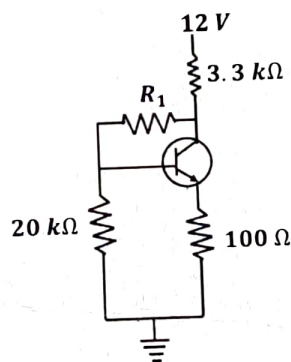


Figure 1

$$\alpha = \frac{\beta}{\beta + 1}$$

$$0.98 = \frac{\beta}{\beta + 1}$$

$$0.98(\beta + 1) = \beta$$

$$0.98\beta + 0.98 = \beta$$

$$0.98 = \beta - 0.98\beta$$

$$0.98 = 0.02\beta$$

$$\beta = \frac{0.98}{0.02} = 49$$

- b) In the circuit given below both the transistor cannot be ON simultaneously: Justify this statement. [Marks 2]

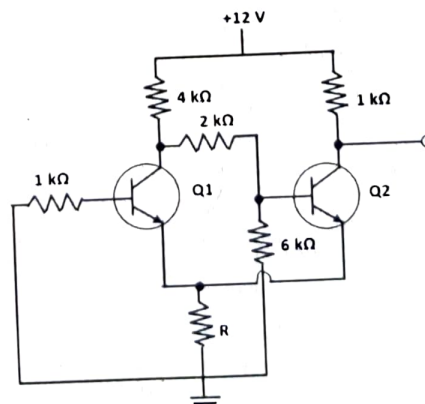


Figure 2

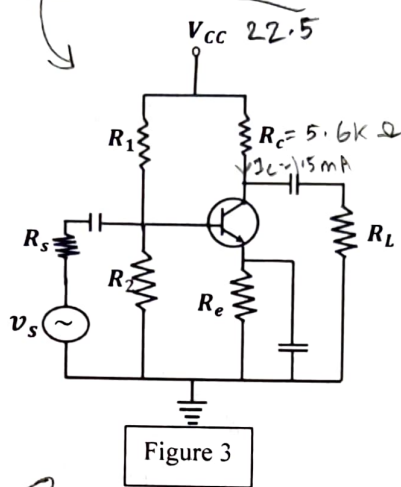
11 → short because ac is not affected

$$\frac{1-\alpha}{\alpha} = \beta \quad 0$$

$$\frac{\alpha}{1-\alpha} = \frac{0.98}{0.02} = 49$$

How justify

3. a) Draw a small signal equivalent circuit for the given amplifier in Figure 3, and hence find out the input impedance, current gain, and voltage gain seen from the source. [Marks 7]



$$R_B = R_1 \parallel R_2$$

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- b) Assume a silicon transistor ($\beta = 50$) as shown in Figure 3. It is desired to establish a Q-point in the active region with $V_{CE} = 12V$, $I_C = 1.5mA$, and stability factor $S = 3$. If $V_{CC} = 22.5V$ and $R_C = 5.6k\Omega$, find the value of R_E , R_1 and R_2 . [Marks 7]

[Ignore reverse saturation current in all the calculations, except finding the expression of $S(=\frac{\partial I_C}{\partial I_{CO}})$]