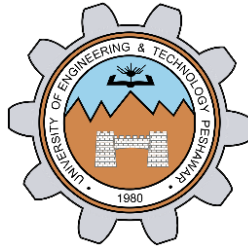# Lab Report - 09

BJT BIASING CIRCUITS FIXED BIASED CONFIGURATION

Spring 2024

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"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to:

Engr. Usman Malik

Month Day, Year (15 05, 2024)

Department of Computer Systems Engineering

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Objectives:
To determine the quiescent operating conditions of the fixed-bias BJT configuration

Equipment:

Proteus software
DC voltmeter
DC ammeter DC
Power Supply

Components Resistors:
2.7 kΩ, 1 MΩ
Transistors: 2N3904, 2N4401

Biasing of the bipolar junction transistor (BJT)
Biasing of the bipolar junction transistor (BJT) is the process of applying external voltages to it. In order to use the BJT for any application like amplification, the two junctions of the transistor CB and BE should be properly biased according to the required application. Depending on whether the two junctions of the transistor are forward or reverse biased, a transistor is capable of operating in three different modes.
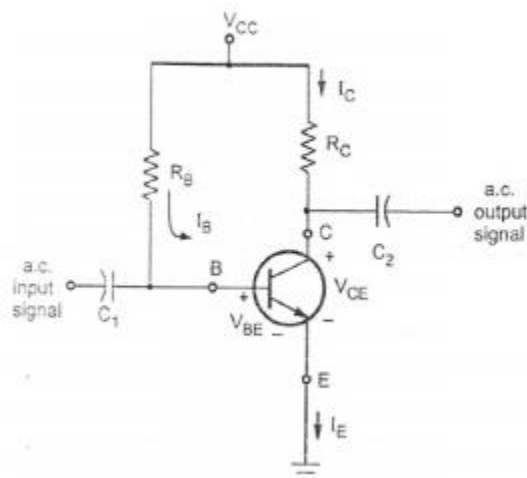
Cutoff Mode of BJT:

The BJT is fully off in this state. In the cutoff mode both the base emitter as well as collector base junction is reverse biased. The BJT is equivalent to an open switch in this mode.

Saturation Mode of BJT:

The transistor is fully on in this state. The CB as well as BE junctions are forward biased. The BJT operates like a closed switch in the saturation mode. If a BJT is in saturation mode than it should satisfy the following condition.

$$|I_B| \geq \left(\frac{|I_C|}{\beta_{DC}}\right)$$

Where, βDC is common emitter current amplification factor or current gain.

Active Mode of BJT:

In order to use the transistor as an amplifier, it must be operated in the active mode. The BE junction is forward biased whereas the CB junction is reverse biased. Figure below shows both n-p-n and p-n-p transistors biased in the active mode of operation.
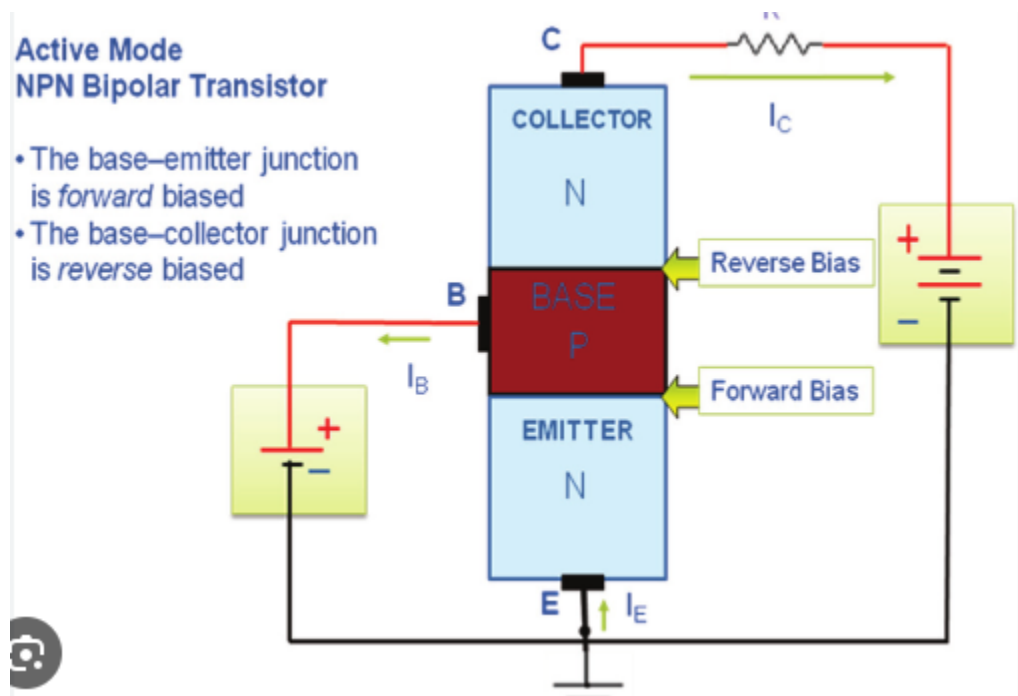
Biasing Circuits of BJT:

To make the Q point stable different biasing circuits are tried. The Q point is also called as

operating bias point, is the point on the DC load line (a load line is the graph of output current vs. output voltage in any of the transistor configurations) which represents the DC current through the transistor and voltage across it when no ac signal is applied. The Q point represents the DC biasing condition. When the BJT is biased such that the Q point is halfway between cutoff and saturation than the BJT operates as a CLASS-A amplifier. The three circuits or biasing arrangements which are practically used are explained below
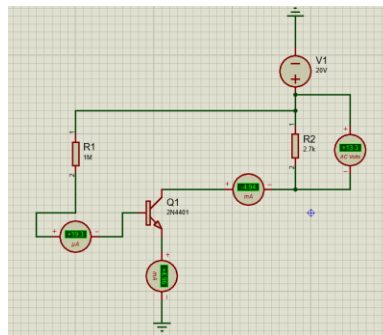
Fixed biased Configuration:

In this condition, a single power source is applied to the collector and base of the transistor using only two resistors. Applying KVL to the circuit, Thus, by merely changing the value of the resistor the base current can be adjusted to the desired value.
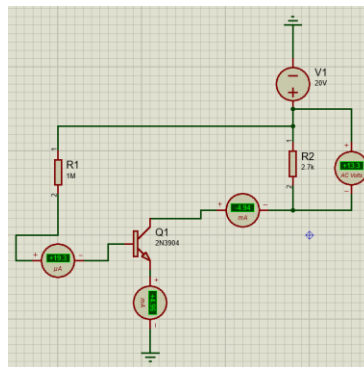
Experiment:

Circuit Diagram:

a. **For 2N4401**

b. **For 2N3904**

Result:

$\Delta\beta$ = 15.67%
ΔI_C = 15.99%
ΔI_B = 0%
ΔV_{CE} = 31.34%