UNIT – I BJT AND FET BIASING

Two Marks Q&A

1. What are the transistor parameters that vary with the temperature?

Ic, I_{CO}, V_{BE} are the parameters varying with the temperature.

2. What is Bias? What is the need for biasing?

Transistor Biasing is the process of setting a transistors DC operating voltage or current conditions to the correct level so that any AC input signal can be amplified correctly by the transistor.

Necessary of transistor biasing

- To active an transistor, biasing is essential. For proper working it is essential to apply to apply voltages of correct polarity across its two junctions.
- If it is not biased correctly it would work inefficiently and produce distortion in the output signal.
- If Q-point is not in the middle, then Output signal is distorted & the signal is clipped

3. What do you understand by DC & AC load line?

DC Load Line

It is the line on the output characteristics of a transistor circuit which gives the values of Ic & V_{CE} corresponding to zero signal (or) DC Conditions.

AC Load Line

This is the line on the output characteristics of a transistor circuit which gives the values of Ic & V_{CE} when signal is applied.

4. What is the meant by operating point Q?

The zero signal values of Ic & V_{CE} are known as operating point. It is also called so because the variations of Ic and V_{CE} take place about this point, when the signal is applied.

5. What are the types of biasing?

The different types of biasing are

(i) Fixed bias

(ii) Collector to Base bias (or) Feedback bias

(iii)Self bias (or) Voltage divider bias

6. What are all the factors that affect the stability of the operating point?

The following are the factors that affect the stability of the operating point,

a. Change of due to replacement of transistors.

b.Thermal variations

7. Define stability factor 'S'?

The stability factor is defined as the rate of change of collector current Ic with respect to the reverse saturation collector current Ico, keeping 'V_{BE}' and 'β ' constant.

$$\text{Stability factor} \quad S = \frac{\Delta I_C}{\Delta I_{CO}} \Bigg|_{\text{Constant } V_{BE} \,\&\, \beta_{dc}}$$

8. What are the disadvantages of collector feedback bias?

The disadvantages of feedback bias are

a. The collector current is high.

b. If AC signal voltage gain feedback into the resistor R_E, it will reduce the gain of the amplifier.

9. Why voltage divider bias is commonly used in amplifier circuit?

The voltage divider bias has the following advantages

a. The operating point will be in stable position.

b. The stability will be considerably improved.

c. Ic can be reduced to the collector leakage current I_{CO}.

10.Define the stability factors S' and S'' ?

The Stability factor S' is defined as the rate of change of Ic with V_{BE} keeping I_{CO} and β constant.

$$S' = \frac{\Delta I_C}{\Delta V_{BE}} \Bigg|_{\text{Constant } I_{CO} \,\&\, \beta_{dc}}$$

The Stability factor S'' is defined as the rate of change of Ic with β keeping V_{BE} and I_{CO} constant.

$$S'' = \frac{\Delta I_C}{\beta dc} \Bigg|_{\text{Constant } I_{CO} \,\&\, V_{BE}}$$

11.Give the stability factor S for the fixed bias circuit.

The stability factor for the fixed bias circuit is, S= 1+β

12.Give the stability factor S for the Collector to base bias circuit.

The stability factor for the Collector to base bias circuit is,

$$S = \frac{(1+\beta)}{(1+\beta(\frac{R_C}{R_B + R_C})}$$

13.Give the stability factor S for the Voltage divider bias circuit.

The stability factor for the Voltage divider bias circuit is,

S=1

14. Why fixed bias circuit is not used in practice?

The stability of the fixed bias circuit is very less. Since the stability factor

S = 1+β , is a large quantity, therefore stability is less. So, it is not used in amplifier circuits.

15. What are all the compensation techniques used for bias stability?

Along with the negative feedback, the following techniques are used for the Q point stability.

a. Diode compensation b. Thermistor compensation c. Sensistor compensation.

16.Why the input impedance of FET is more than that of a BJT?

The input impendence of FET is more than that of a BJT because the input circuit of FET is reverse biased whereas the input circuit of BJT is forward biased.

17.How FET is known as Voltage variable resistor?

In the region before pinch off, where V_{DS} signal small, the drain to source resistance r_d can be controlled by the bias voltage V_{GS}. Therefore FET is useful as voltage variable resistor (VVR) or Voltage dependent Resistor (VDR)

18.List the advantages of Fixed bias method?

The advantages of fixed bias method are,

a. The stability of the operating point is greatly improved when compared with the other circuits.

b. Less cost and simple circuit.

19.How self-bias circuit is used as constant current source?

In the self bias circuit if Ic tends to increase because of I_{CO} has increasing as a result of temperature, the current I_E in R_E increases. As a consequence of this, there is an increase in voltage drop across R_E, that provides negative feedback, the base current is decreased. Hence constant I_C value is maintained in the self bias circuit.

20.What is Thermal runaway?

The continuous increase in collector current due to poor biasing cause the temperature at collector terminal to increase. If no stabilization is done, the collector leakage current also increases. This further increases the temperature. This action becomes cumulative and ultimately the transistor burns out. The self destruction of an unstabilised transistor is known as thermal runaway.

21. What are the consideration factors that are used for the selection of an operating point for an FET amplifier?

The consideration factors are,

a. Output voltage swing, b. Distortion, c. Power dissipation, d. Voltage gain,

e. Drift (or) Drain current.

22.Write the different types of FET biasing circuits.

The FET biasing circuits are classified as,

a. Gate bias,

b. Self bias

c. Voltage divider bias, d. Current source bias ,e. Drain feedback bias f. Zero bias.

23. What is meant by stabilization?

The maintenance of the operating point fixed stable is known as stabilization.

24. why an ordinary junction transistor is called bipolar?

Because the transistor operation is carried out by two types of charge carriers (majority and minority carriers), an ordinary transistor is called bipolar.

25. Why transistor is called current controlled device?

The output voltage, current or power is controlled by the input current in a transistor. So it is called the current controlled device.