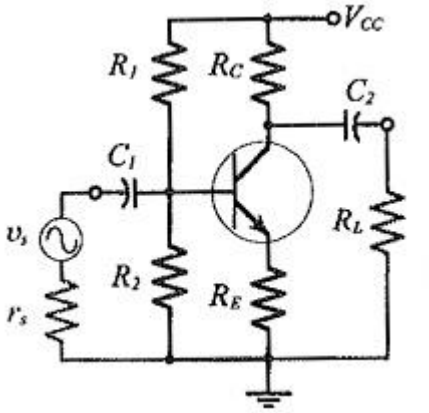
Unit 2 : BJT AND FET AMPLIFIER

1. Draw the low frequency simplified h-parameter model of an amplifier with a un bypassed emitter resistor.



2. Why an NPN transistor has a better high frequency response than the PNP transistor?

An NPN transistor has a better frequency response than the PNP transistor because the mobility of electron is more and capacitive effect is less.

3. Define fT and f.

Unity gain frequency (fT) or frequency parameter. It is defined as the frequency at which the common emitter shirt circuit current gain has dropped to unity and is denoted by the symbol (fT)

4. Beta cut-off frequency (fT).

It is defined as the high frequency at which -of a CE transistor drops to 0.707 or 3dB from its lower frequencies

5. What is the need for having a high value of fT?

Bandwidth of the amplifier is directly proportional to fT. Hence tp have larger bandwidth, the value of fT should be high.

6. Why N-channel FET’s have a better response than P-channel FET’s?

N-channel FET has a better high frequency response than P-channel FET due to the

following reason.

a. Mobility of electrons is large in N-channel FET whereas the mobility of holes is poor in P-channel FET

b. The input noise is less in N-channel FET that that of the P-channel FET

c. The transconductance is larger in N-channel FET that that of P-channel FET

7. Write the relation between the sag and lower cutoff frequency?

$f_H = 2.2 / (2t_r) = 0.35/t_r$

8. What is dominant network?

In high frequency analysis of an amplifier, the network having lower critical frequency is called dominant network.

9. What is the function of Miller input capacitance of an amplifier?

The Miller input capacitance of an amplifier is a function of Bypass capacitor.

10. What is the use of source bypass capacitor in CS amplifier?

Source bypass capacitor in CS amplifier is used for improving the voltage gain.

11.Give two advantages of common source FET amplifier?

a. Good voltage gain

b. High input impedance.

12. What are the advantages of representation of gain in decibels?

a. In multistage amplifier, it permits to add individual gains of the stages to calculate overall gain.

b. It allows us to denote, both very small as well as very large quantities of linear scale by considerably small figures.

13. Write the relation between the sag and lower cut-off frequency.

The tilt of sag in time t1 is given by

P = Y of tilt

f = input signal frequency

14. Give the voltage gain for CE configuration including source resistance.

VB = VCC R2/R1+R2
Sometimes, 'β' is referred to as 'hFE' which is the forward current gain of the transistor within the CE configuration. Beta (β) is a fixed ratio of the two currents like Ic and Ib, so it doesn't contain units.

15. Why thermal runaway is not there in MOSFETs?

MOSFET is temperature dependent. In MOSFET, as temperature increases drain resistance also increases', reducing the drain current. So thermal runaway does not occur in MOSFET.

16. Define transconductance?

The change in the drain current due to change in gate to source voltage can be determined using the transconductance factor gm. $\Delta Id = gm\ \Delta VGS$

17. Define emitter bypass capacitor?

An emitter bypass capacitor CE is connected in parallel with the emitter resistance, REto provide a low reactance path to the amplified ac signal. If it is not inserted, the amplified ac signal passing through REwill cause a voltage drop across it. This will reduce the output voltage, reducing the gain of the amplifier.

18. Define coupling capacitor?

The coupling capacitor cs, couples the output of the amplifier to the load or to the next stage of the amplifier. It blocks dc and passes only ac part of the amplified signal.

19. Define current gain

The ratio of output current to input current is called current gain, AI, of the amplifier. AI= I2 / I1.

20. Define voltage gain

The ratio of output voltage to input voltage is called voltage gain AV , of the amplifier. AV= V2/ V1

21. Define benefits of h-parameter.

- Real numbers at audio frequencies
- Easy to measure
- Can be obtained from the transistor static characteristic curves
- Convenient to use in circuit analysis and design.
- Most of the transistor manufacturers specify the h-parameter.

22. What are the techniques used to improve input impedance.

- Using direct coupling (Darlington connection)
- Using Bootstrap techniques

23. Why the Darlington connection is not possible for more number of stages?

In Darlington connection of two transistors, emitter of the first transistor is directly connected to the base of the second transistor. Because of direct coupling dc output current of the first stage is (1+hfe)Ib1. If Darlington connection for n stage is (1+hfe)n times Ib1. Due to very large amplification factor even tow stage Darlington connection has large output current and output stage may have to be a power stage. As power amplifiers are not used in the amplifier circuits it is not possible to use more than two transistors in the Darlington connection.

24. Briefly explain why dominant pole high frequency compensation method used in amplifiers.

- As the noise frequency components are outside the smaller bandwidth, the noise immunity of the system improves.
- Adjusting value of fd adequate phase margin and stability of the system is assured.