

# UNIT 5-IC MOSFET AMPLIFIERS

## 1. Define an Integrated circuit.

An integrated circuit(IC) is a miniature ,low cost electronic circuit consisting of active and passive components fabricated together on a single crystal of silicon.The active components are transistors and diodes and passive components are resistors and capacitors.

## 2. What are the advantages of ICs over discrete circuits.?

1. Minimization & hence increased equipment density.
2. Cost reduction due to batch processing.
3. Increased system reliability
4. Improved functional performance.
5. Matched devices.
6. Increased operating speeds
7. Reduction in power consumption

## 3. List the disadvantages of ICs

- Inductors cannot be fabricated
- IC function at very low voltage
- Limited amount of power
- Excessive heat

## 4. Define steering current.

In integrated circuit designs circuits use constant sources.here the constant d.c current called reference current is generated at one location and is then replicated at various other locations for biasing the various stages of amplifier present in the circuit. this process is known as current steering.

## 5. State the advantages of current steering?

- The external components such as precision resistors required to generate a predictable and stable reference current,need not be repeated for every amplifier stage.
- The bias currents of the various stages track each other when there is any change due to power supply voltage or temperature.

## 6. Define cascade current mirror circuit.

MOSFET current source circuits the output resistance is a measure of stability of  $I_o$  with respect to the changes in the output voltage. Here MOSFET T3 and T4 are included to provide higher output resistance. This circuit is known as cascade current mirror circuit.

**7. Define Wilson current mirror circuit?**

MOSFET Wilson current source the  $V_{DS}$  values of T1 and T2 are not equal. Since  $\lambda$  is not zero, the ratio  $I_o/I_{ref}$  is slightly different from the aspect ratio.

**9. List the various types of active loads?**

There are three types of load devices:

- N-channel enhancement mode device
- N-channel depletion-mode device
- P-channel enhancement mode device

**10. State the advantages of NMOS amplifier with depletion load over enhancement load.**

The voltage gain of NMOS amplifier with depletion load is significantly larger than that with the enhancement load, however, like NMOS amplifier with enhancement load, the body effect lowers the small-signal voltage gain.

**11. Define  $\beta$  and  $\alpha$ .**

- $\alpha$  is a current gain which is the ratio of collector current to the base current.
- $\beta$  is a forward current gain which is the ratio of collector current to the emitter current.

**12. What is meant by over drive factor?**

The over drive factor is defined as the ratio of  $I_B$  and  $I_{BS}$ . Where,  $I_B$  is the base current and  $I_{BS}$  is the base current that produces the saturation.

**13. Define delay time.**

During the delay time period, base emitter voltage  $V_{BE}$  is applied, the base current  $I_B$  rises to  $I_{BS}$  and the collector current  $I_C$  is equal to zero or collector emitter leakage current  $I_{CEO}$ . The time required to charge the base emitter capacitance to,  $V_{BES}=0.7 V$ .

**14. Define rise time.**

During the rise time period, collector current  $I_C$  raises to steady state values  $I_{CS}$  and the collector emitter voltage falls from  $V_{CC}$  to  $V_{CES}$  the rise time depends on the input capacitance.

**15. What is the need of driver circuit?**

It provides amplified voltage and current to the device.

It provides isolation between control circuit and power circuit.

**16. State methods which are used to provide effect of increased RE.**

- Constant current bias method
- Use of current mirror circuit
- Use of an active load.

**17. What is current mirror ?**

The circuit in which the output current is forced to equal the input current is called as current mirror circuit. In a current mirror circuit, the output current is the mirror image of input current.

**18. State advantages of current mirror circuit. 1)Provides very high emitter resistance RE. 2)Easy to fabricate.**

Requires less components than constant current bias. 4)Simple to design

With properly matched transistors, collector current thermal stability is achieved.

**19. What are the types of internal capacitance in the MOSFET?**

There are two types of

1. Gate capacitance
2. junction capacitance

**20. Define gate capacitance.**

It is a parallel plate capacitance formed by a gate electrode with the channel with the oxide layer acts as a capacitor dielectric. It is denoted as  $C_{ox}$ .

**21. List the advantage of active load.**

- provides very high ac resistance
- provides high differential mode voltage gain
- $A_d$  High
- CMRR High