

BE pre lab 12:

Q1) A MOSFET is a voltage controlled current source and by changing the gate to source voltage, we can change the current that is flowing between the source and the drain. In many applications we have to give a predetermined flow of current to the load and this predetermined current needs to be stable and independent of the voltage across the current source component. As we can control this current using the gate voltage (V_{gs}) and we can provide a constant current at a constant voltage without affecting the voltage between source and drain when in saturation region.

Q2) **Definition:** A current mirror is a circuit that takes an analog current, reference current, input and replicates it, making one or more copies. The copies are the same as the reference current, they have the same characteristics and they are as stable as the reference current.

MOSFET Current Mirror: When using a MOSFET, the reference current is converted into a voltage using diode connected transistor and that voltage is then applied to the gate of another MOSFET. Hence, the voltage from the reference current acts as the gate to source voltage for another MOSFET.

Significance: The current mirror is used in integrated circuits mainly to bias the amplifiers. The advantage of biasing the amplifiers with the current source is that it provides a high voltage gain and good biasing stability. The integrated circuit may contain hundreds or thousands of such amplifiers. To bias all the amplifiers with precise biasing voltage is another challenge. So, to overcome all these problems, in integrated circuits, one stable current source is fabricated within the IC, and using the current mirror multiple copies of the stable current source is generated (which can be used to bias the amplifiers). We can also use the current mirror to copy the current of a low impedance current source on a high impedance MOSFET.