Reg. No. 21BCE1297 **Name: Vidhi Shah** **Date of Practical: 13/04/22**

Experiment 7

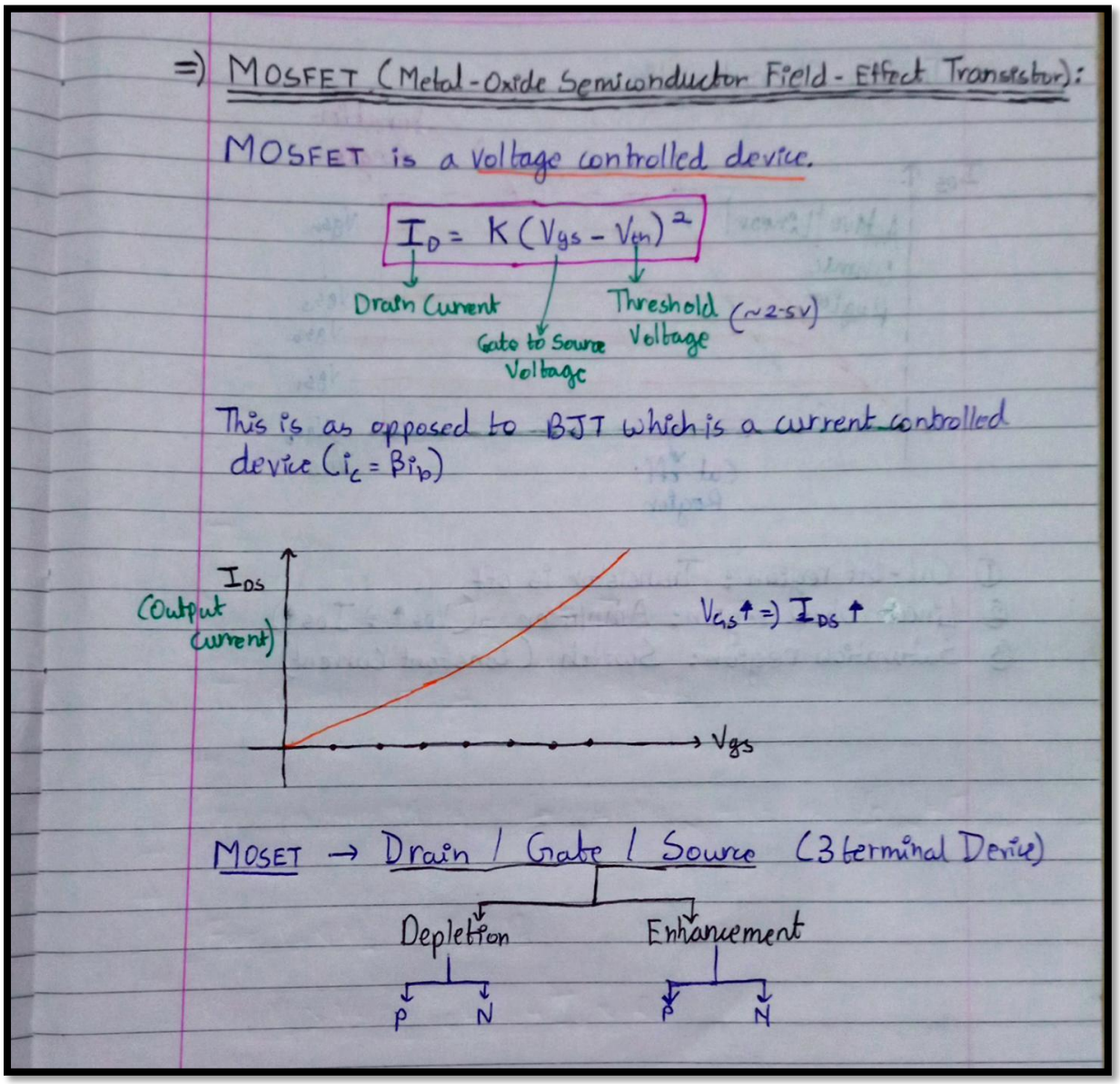
Aim:

Study and simulation of MOSFET (Metal-Oxide Semiconductor Field-Effect Transistor) characteristics using LTSpice.

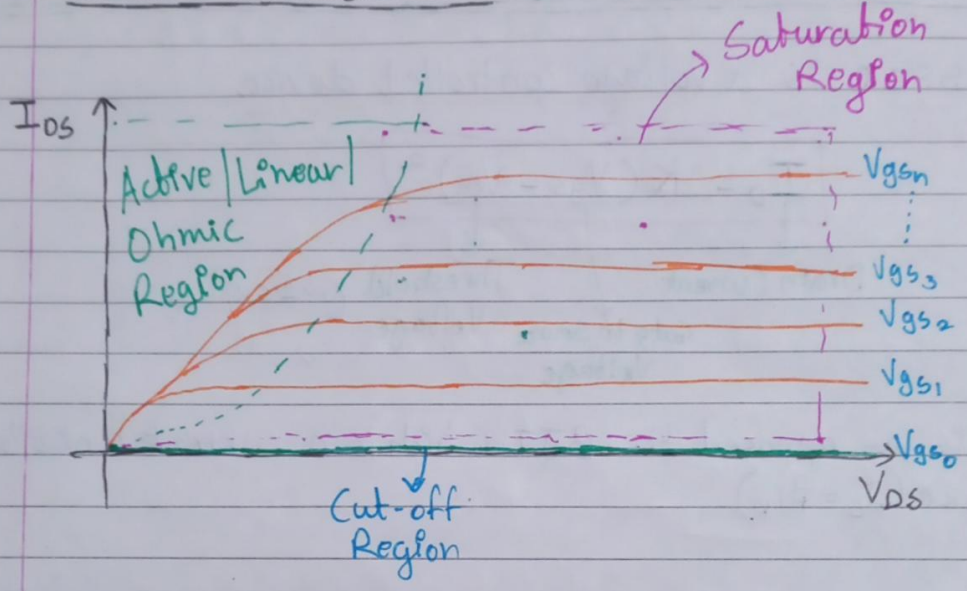
Tools and Apparatus:

LTSpice, MOSFET Transistor, Resistors, Voltage Sources

Theory and Design:



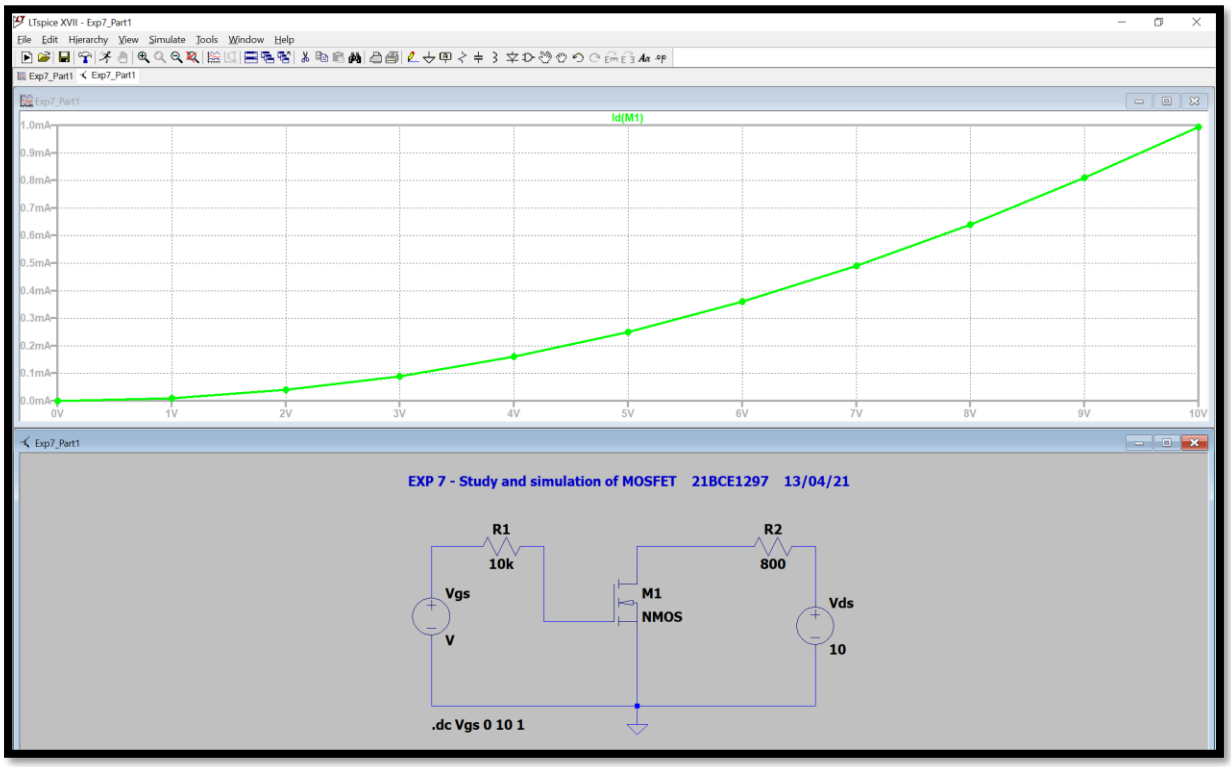
→ Transfer Characteristics :



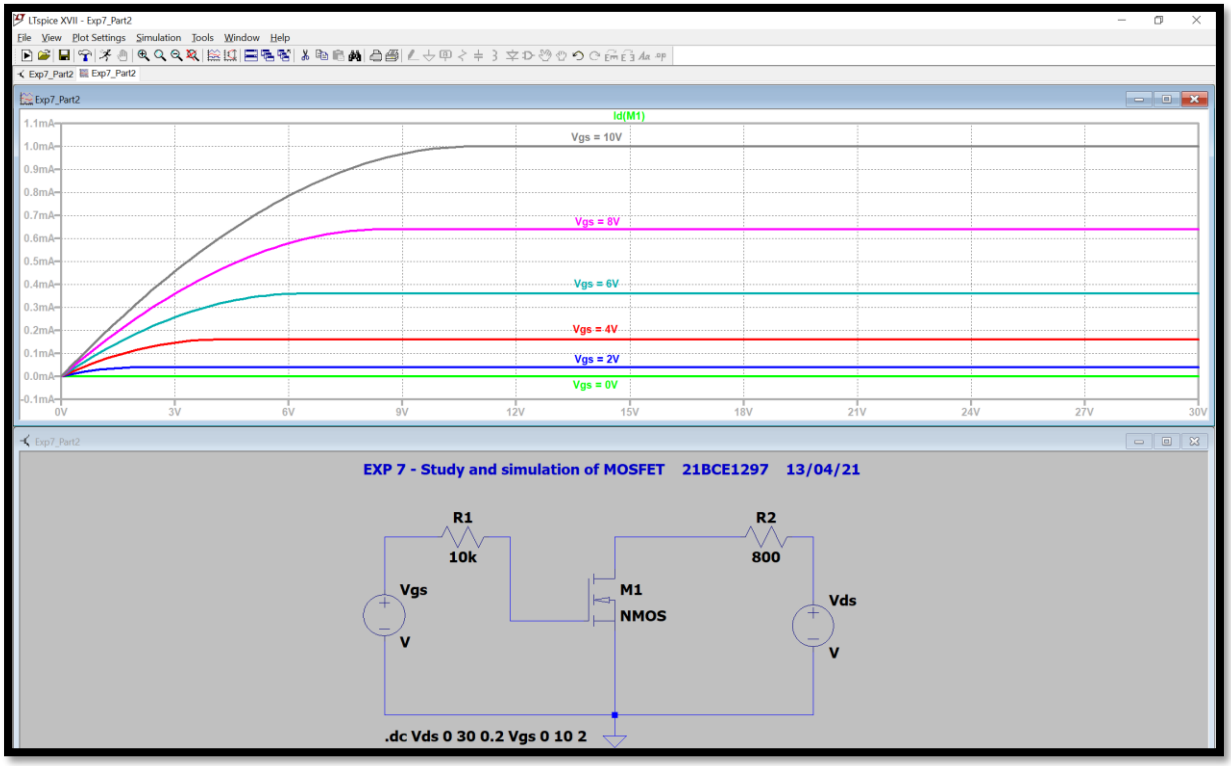
① Cut-off region : Transistor is off.
② Linear / ohmic region : Amplifier (V_{DS} ↑ ⇒ I_{DS} ↑)
③ Saturation region : Switch (constant current)

Simulation Results:

1. Output Characteristics



2. Transfer Characteristics



Conclusion:

1. **Output Characteristics:**
    - I_{DS} increases as V_{GS} increases.
2. **Transfer Characteristics:**
    - I_{DS} increases linearly with respect to V_{DS} in Active/Linear/Ohmic region.
    - I_{DS} remains constant with respect to V_{DS} in Saturation region.

Inferences:

1. $\boxed{I_{DS} = K (V_{GS}-V_{TH})^2}$
    a. Therefore, I_{DS} increases as V_{GS} increases in output characteristics of MOSFET
2. VGS = 0V is **Cut Off Region**:
    a. Transistor is in **off** state.
3. **Linear/Ohmic Region**:
    a. Transistor acts as an **amplifier** as **current increases** with increase in voltage
4. **Saturation Region**:
    a. Transistor acts as a **switch** as **current remains constant** with respect to voltage
5. In transfer characteristics keep first source as V_{DS} and second source as V_{GS}.