AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING (EEE)

EXPERIMENT NO.	**:**	**08**
NAME OF THE EXPERIMENT	**:**	**STUDY OF JFET AND MOSFET CHARACTERIZATION.**
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COURSE TITLE	**:**	**ELECTRONIC DEVICES LABORATORY**
SECTION	**:**	**Q**
GROUP NO.	**:**	**05**
DATE OF PERFORMANCE	**:**	**APRIL 6, 2023**
DATE OF SUBMISSION	**:**	**APRIL 7, 2023**

Objectives of the Experiment:

The main objective of the experiment is to gain familiarity with the characteristic of JFETs and MosFETs which involves understanding their basic operation and determining the threshold voltage aswell as measuring their I-V characteristics and identifying the different operating regions for both type of transistors.

List of components:

1. Trainer Board
2. Multimeter
4. DC power supply
5. Resistor (1KΩ)
6. Field effect Transistor (J176)
7. Metal oxide semi conductor FETs (2N7000)
8. Connecting wires.

Diagram:

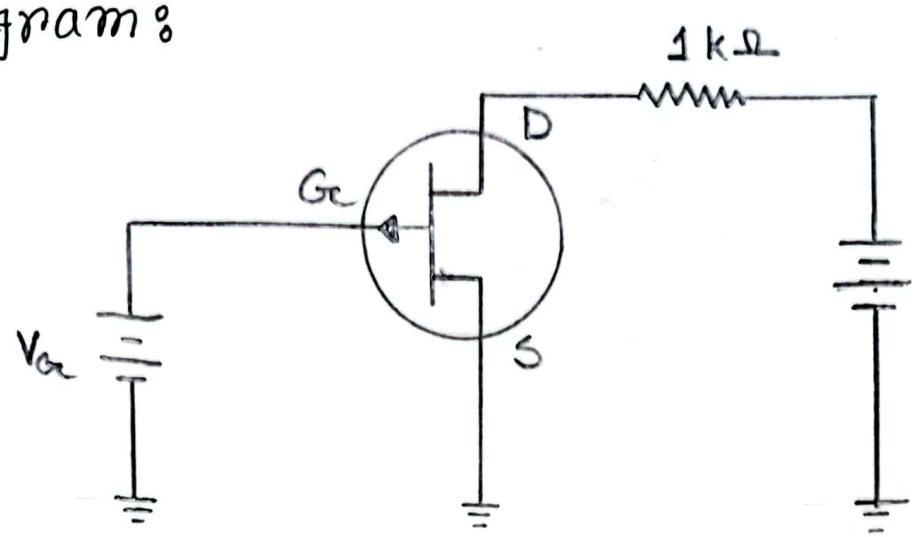


Figure: 1- Transfer Characteristics of P-channel JFET (J176)

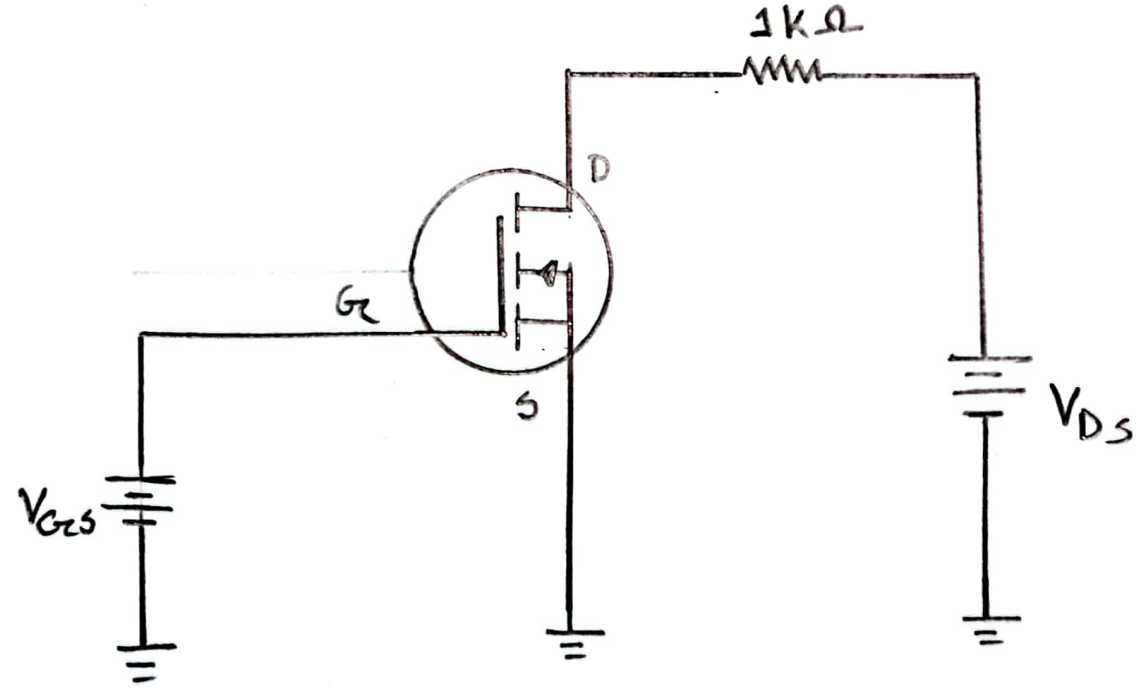


Figure: 2- Transfer Characteristic of n-channel enhancement MOSFET (2N7000)

Working Principle of the Circuit:

P-Channel JFET: A p channel JFET, operates the principle of controlling flow of current through a channel fromed by a p-type material by varying the voltage applied to a gate made of N-type material. when the voltage applied to the gate is negative with respect to the source, it creates a depletion region in the p-type material which reduces the width of channel and hence decrease the flow of current between the souree and drain. Conversely, when the gate voltage is towards zero or positive, the depletion region narrows and, the channel widens, allowing more current flow.

N-Channel MOSFET: An channel MOSFET that operates by controlling the flow of current through a channel between souree and drain terminal using an electric field generated by the voltage applied to the gate terminal. when a positive voltage applied to the gate it creates an electric field that attracts negative charge carries to the channel, increasing its conductivity and allowing current follow. Conversely, when the gate

voltage is reduce to zero or made negative the channel conductivity decreases and current flow is impeded.

Data & Calculation:

Table-1 pchannel JFET V_{GS} and I_D characteristic where $V_S = 10V$

V_{GS} (volts)	V_{GS} (volts)	I_D (mA)
10	10	0
11	11	0
12	12	0
13	13	0
14	14	0
15	15	0
16	16	0
17	17	0
18	18	0
19	19	0

Table-2 pchannel JFET V_{DS} and I_D Characteristic; V_{GS}=15

V_S (volts)	V_{DS} (volts)	I_D (mA)
0	0	0
1	1	0
2	2	0
3	3	0
4	4	0
5	5	0
6	6	0
7	7	0
8	8	0
9	9	0

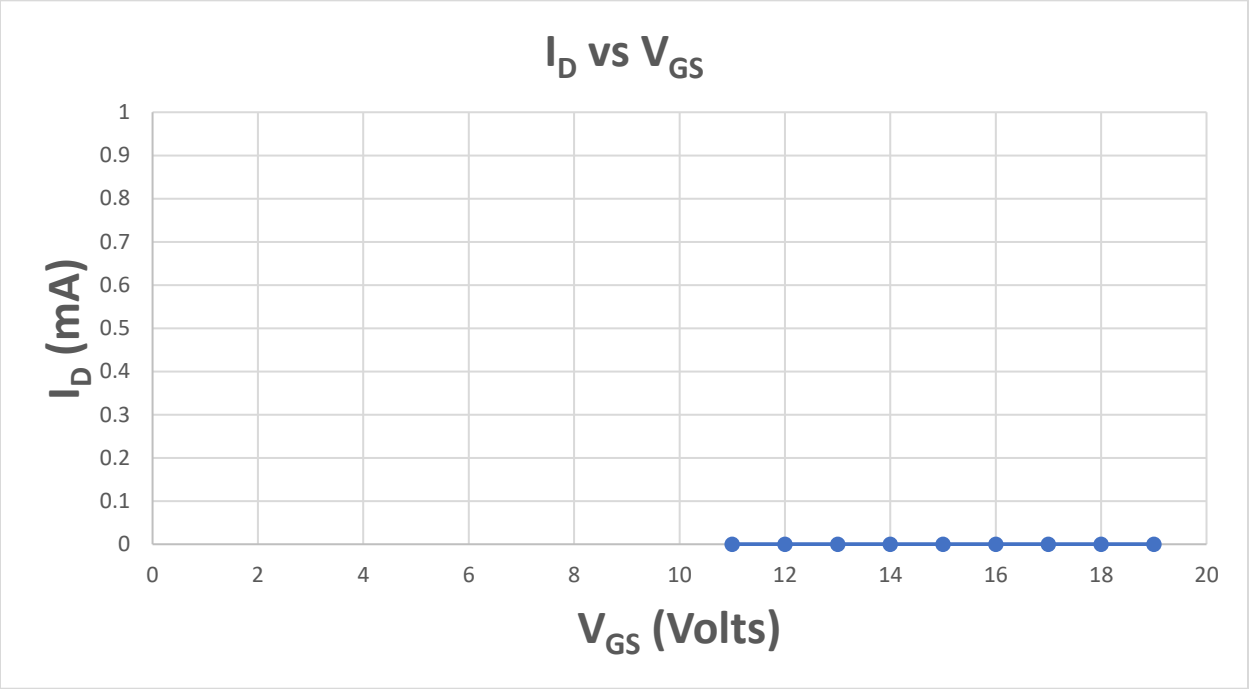
Table-3: n-channel MOSFET V_{GS} and I_D Characteristic where V_{DS}=10V

V_{GS} (volts)	I_D mA
0	0
1	0
2	0
3	50.129
4	200.757
5	450.802
6	799.828
7	1247
8	1729
9	2435

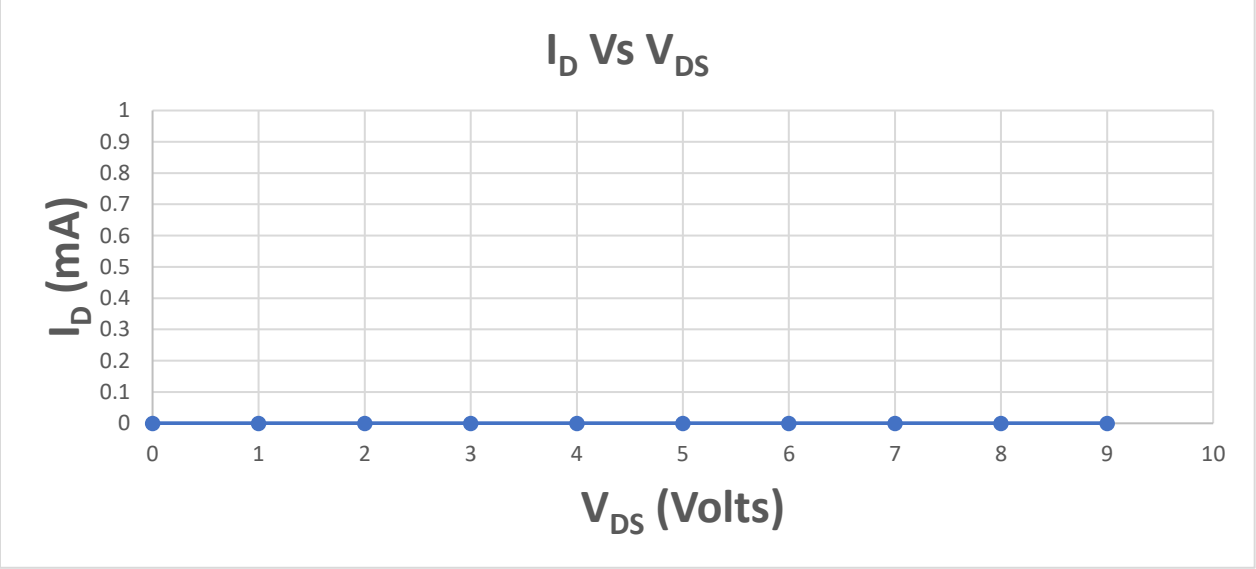
Table-4: n Channel MOSFET V_{DS} and I_D Characteristic where V_{GS}=5V

V_{DS} (volts)	I_D (mA)
0	0
1	200.08
2	350.425
3	437.326
4	450.802
5	450.802
6	450.802
7	450.802
8	450.802
9	450.802

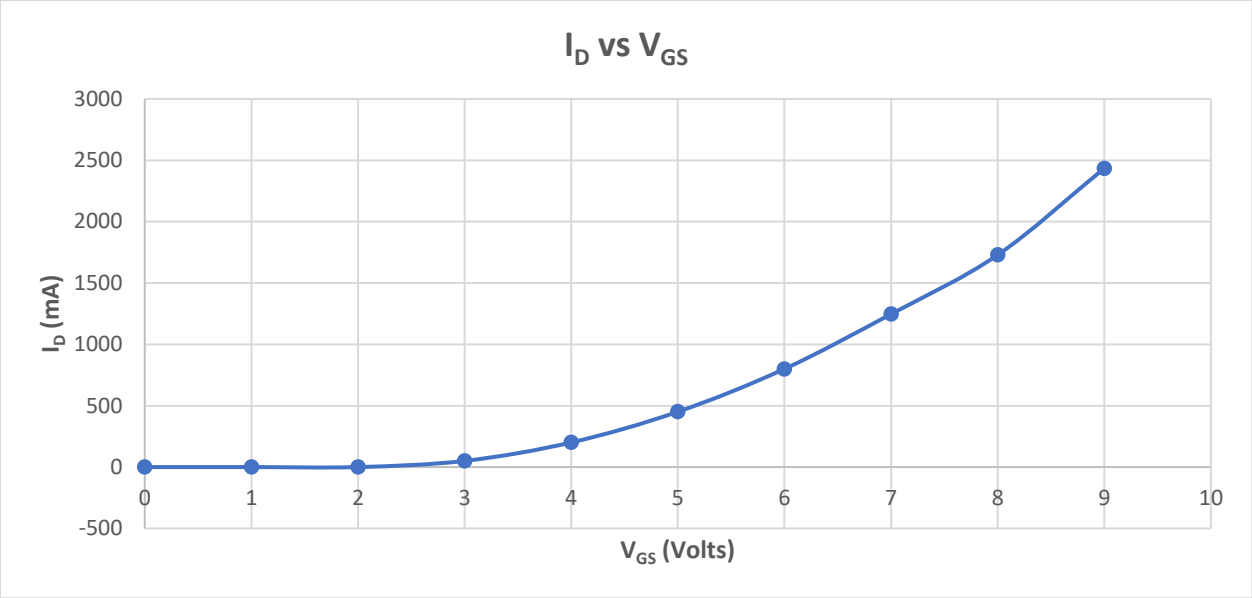
Graphs:



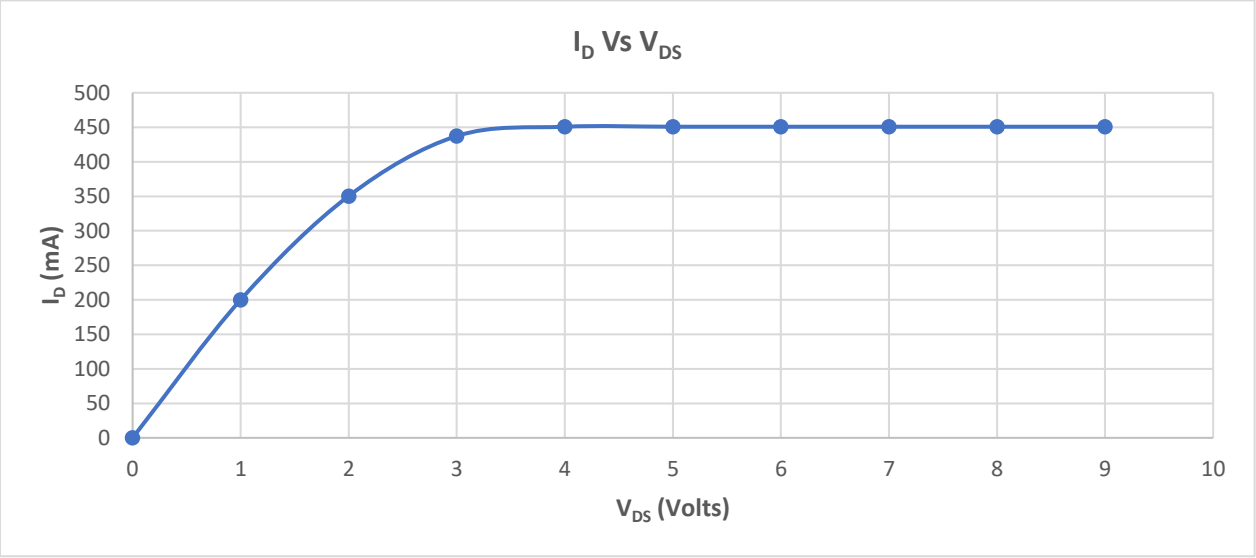
I_D vs V_{GS} Graph of Table-1



I_D vs V_{DS} Graph of Table-2

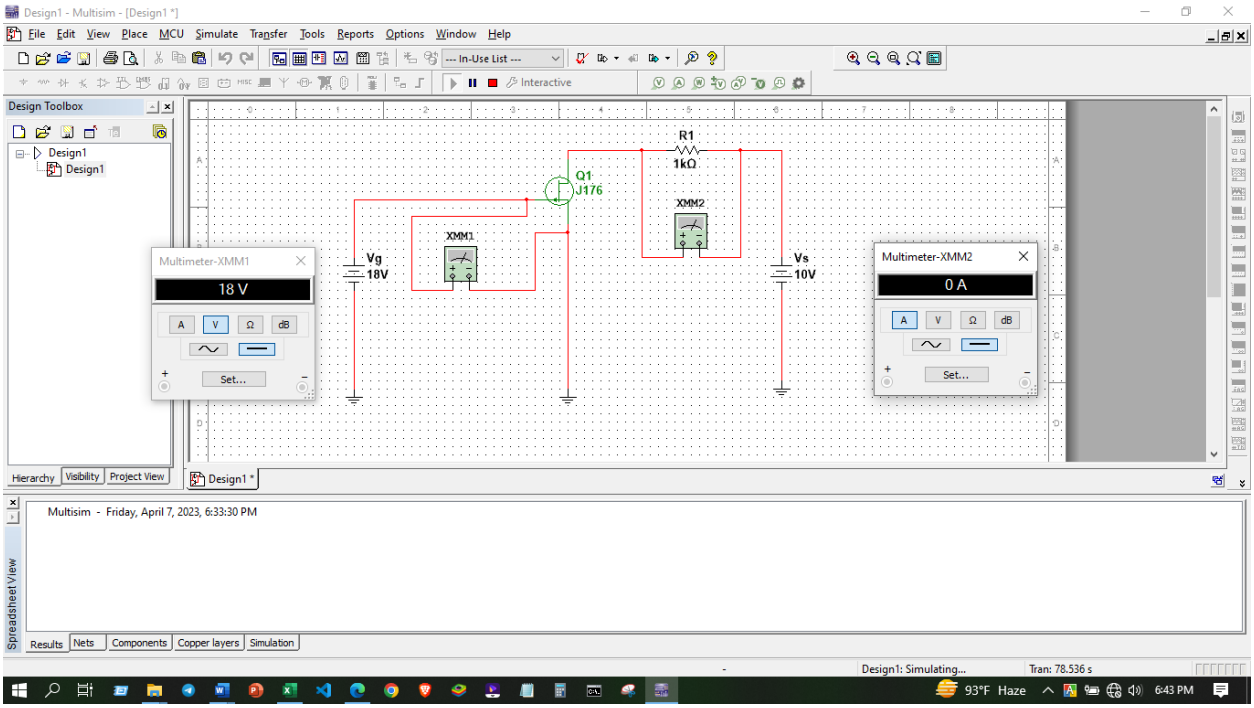


I_D vs V_{GS} Graph of Table-3

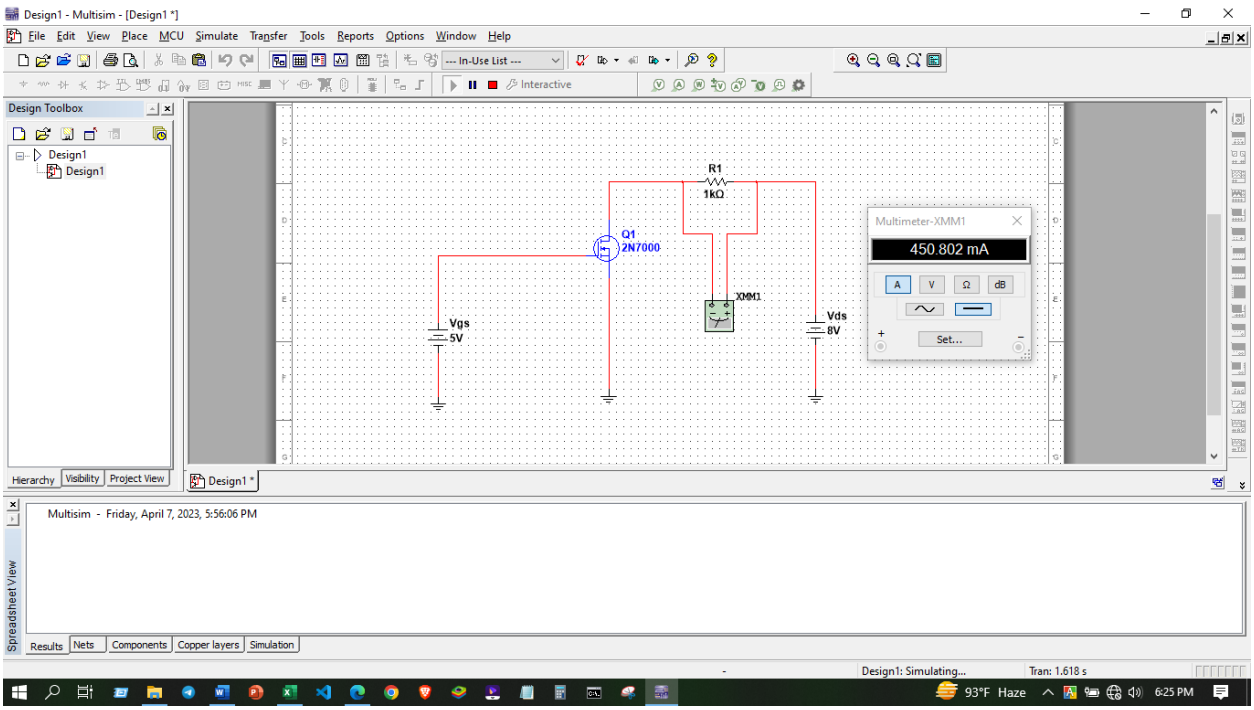


I_D vs V_{DS} Graph of Table-4

Simulations:



Simulation for Transfer Characteristics of P-channel JFET(J 176)



Simulation for Transfer Characteristics of n-channel enhancement MOSFET (2N7000)

Discussion:

From this experiment the characteristic of JFET and MOSFET are observed. All the redings are taken by simultain by using mutisim. And all values were noted down carefully. All graphs are also polted using microsof excel with necessary title. From this experiment we learned that JFETs can only be operated in depletion mode where MOSFETS can operate both depletion mode and enhancement mood. JFETS have high input impedence that makes them sensitive to voltage signals. MosFETs offer even higher input impedence than th JFETs which make them more resistive at the gate terminal.

Conclusion:

The goal of the experiment was to comphend the fundamental workings of JFETs and MosFETs and establish the thershold voltage and to quantify th I-V charcteristic and identify JFET and MOSFET operating zones, this was done successfully.

Remarks:

The study of JFET and MOSFET characterization is a fundamental experiment for us. It allow us to understand the current and voltage characteristic in JFET and MOSFET.

List of References:

[1] A.S. Sedra, K.C. Smith, Microelectronic Circuits.

[2] American International University-Bangladesh (AIUB) Electronic Devices Lab Mannual.