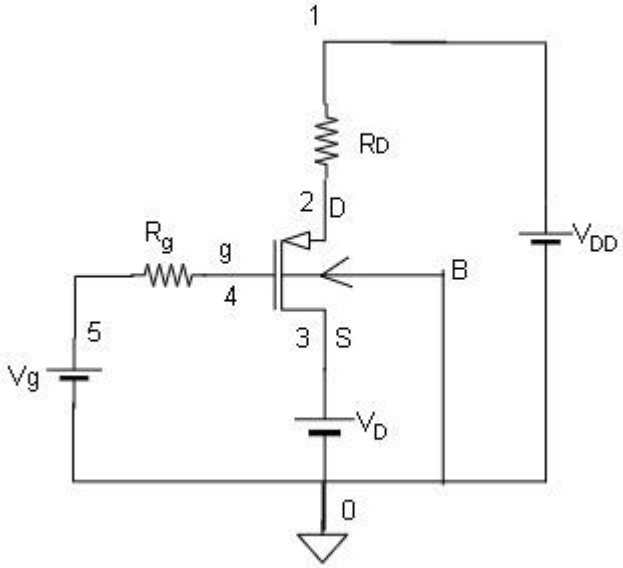
EXPT NO: 8 **DATE:**

NMOS & PMOS CHARACTERISTICS USING SPICE

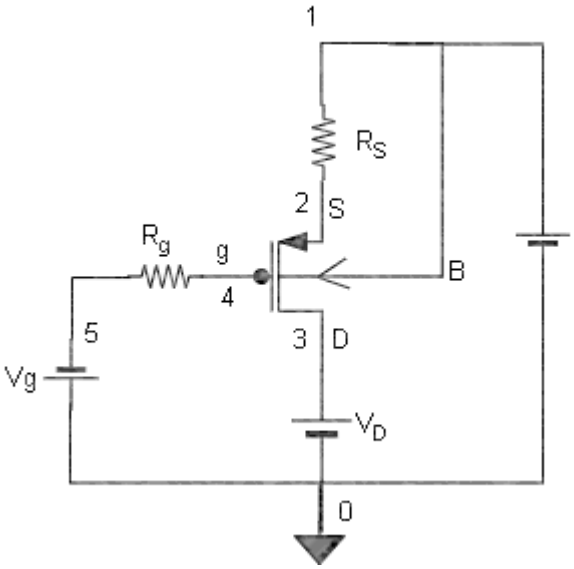
Aim: To plot the NMOS and PMOS Characteristics using SPICE.

Software required: Ubuntu 22.04, NGSPICE.

Circuit Diagrams:



(NMOS Characteristics)



(PMOS Characteristics)

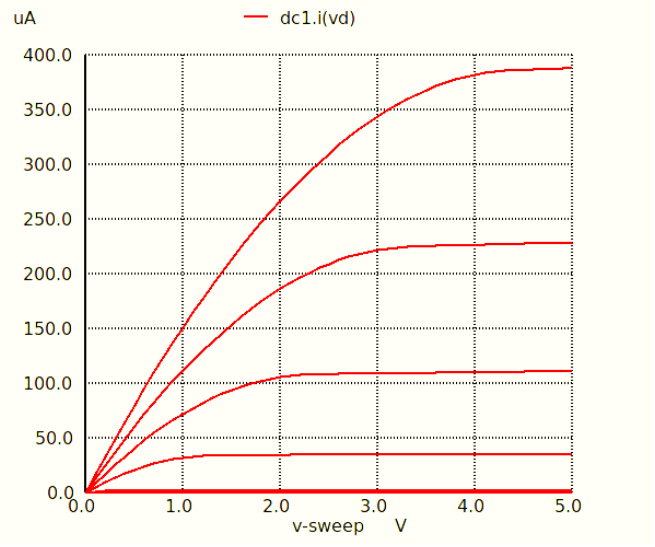
SPICE program for NMOS characteristics:

```
NMOS Characteristics

* Circuit parameters:
VDD       1 0 5
RD        1 2 100
VD        3 0 0
RG        4 5 100k
VG        5 0 5
M1        2 4 3 0 n_mos l=4u w=8u

* Defining model:
.model n_mos nmos(kp=20u vt0=0.7 lambda=0.01 gamma=0.02)

* DC analysis:
.control
dc VDD 0 5 0.1 VG 0 5 1
dc VG 0 5 0.1 VDD 0 5 1

* Plotting parameters:
set color0=rgb:f/f/b
set color1=rgb:0/0/0
set color2=rgb:f/0/0
set xbrushwidth=2

plot dc1.i(VD)
set color2=rgb:0/0/f
plot dc2.i(VD)

.endc
.end
```

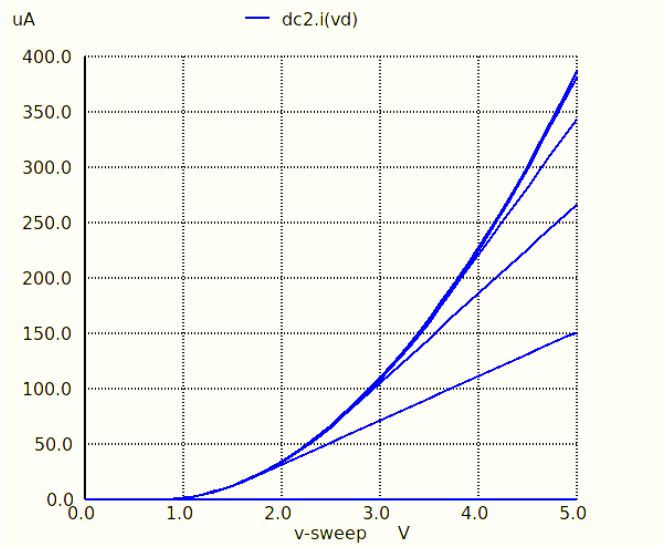
SPICE program for PMOS characteristics:

```
PMOS Characteristics

* Circuit parameters:
VDD     1 0 5
VD      0 3 0
VG      5 0 -5
RD      1 2 100
RG      4 5 100k
M1      3 4 2 1 p_mos l=4u w=8u

* Defining model:
.model p_mos pmos(Vto=-0.7 Kp=20u lamda=0.3 Gamma=0.02)

* DC analysis:
.control
dc VDD 0 5 0.1 VG 0 -5 -1
dc VG  0 -5 -0.1 VDD 0 5 1

* Plotting parameters:
set color0=rgb:f/f/b
set color1=rgb:0/0/0
set color2=rgb:f/0/0
set xbrushwidth=2

plot dc1.i(VD)

set color2=rgb:0/0/f

plot dc2.i(VD)
.endc
.end
```

NMOS Characteristics

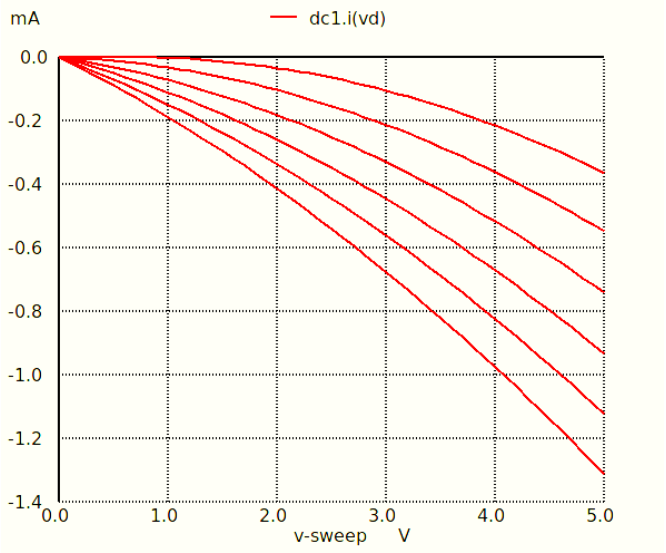


(I_D vs V_{DS} for NMOS)

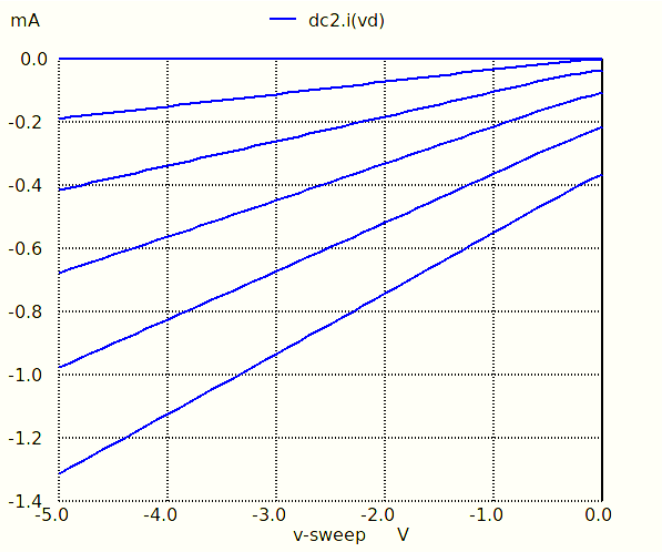


(I_D vs V_{GS} for NMOS)

PMOS Characteristics



(I_D vs V_{DS} for PMOS)



(I_D vs V_{GS} for PMOS)

Conclusion: The SPICE programs were written successfully to plot the PMOS and NMOS Characteristics.