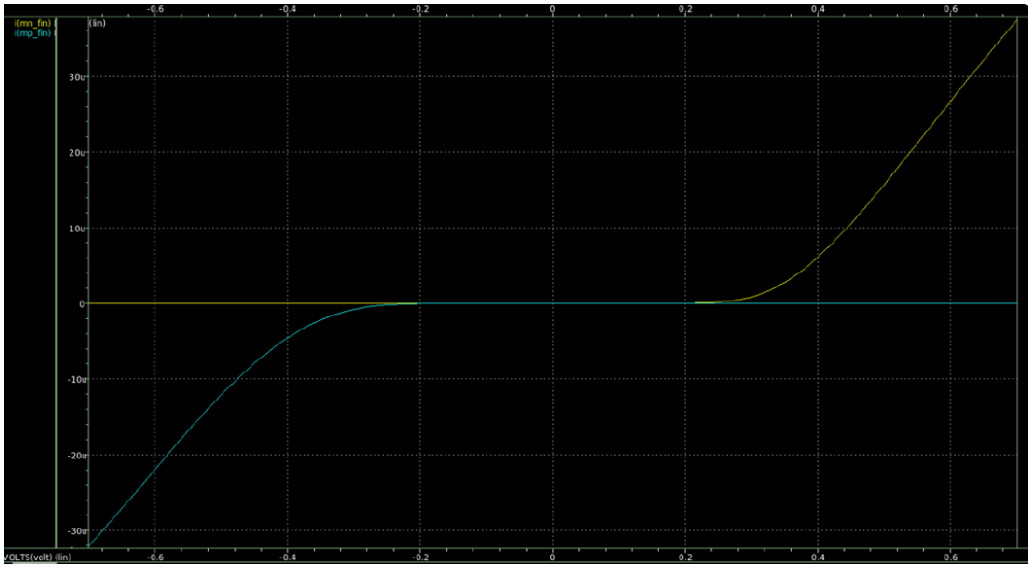
數位積體電路

Lab1

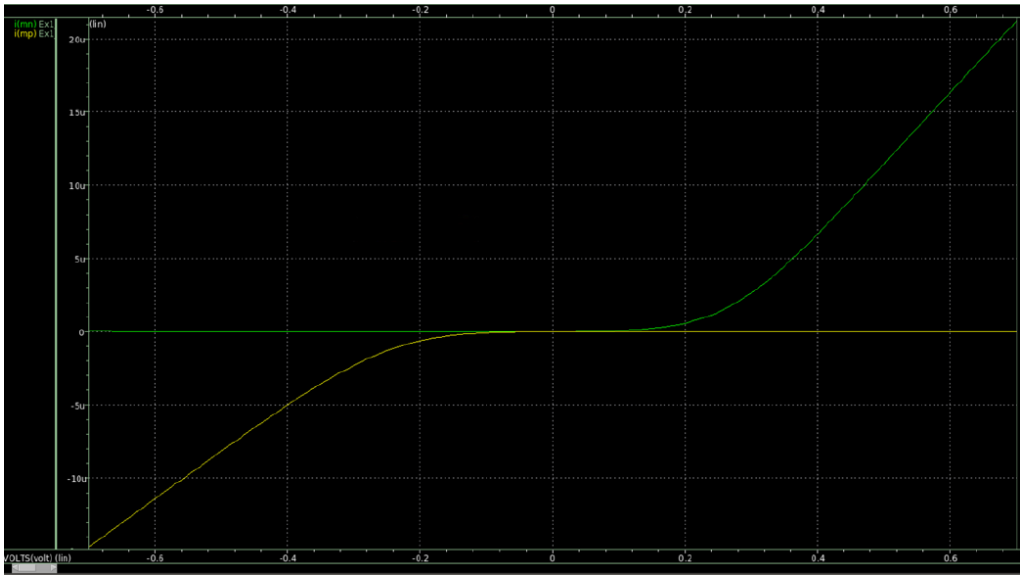
智能系統所 312581006 張宸瑋

Exercise 1-1. DC characteristics

Vgs-IDS of FinFET



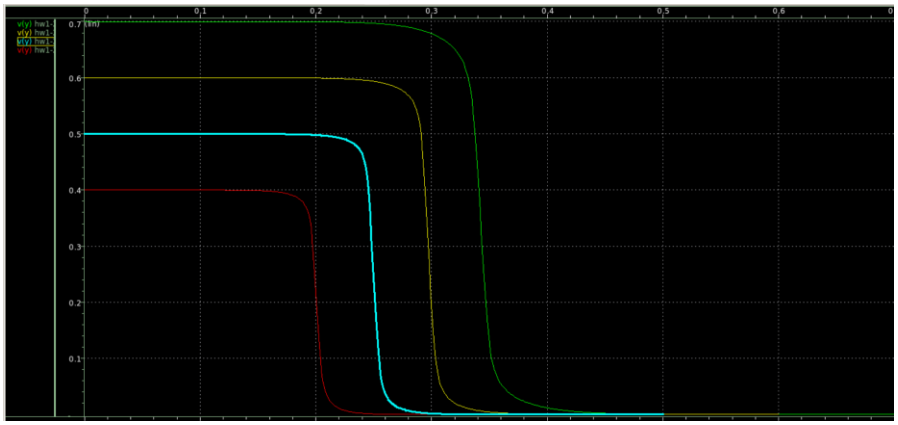
Vgs-IDS of CMOS



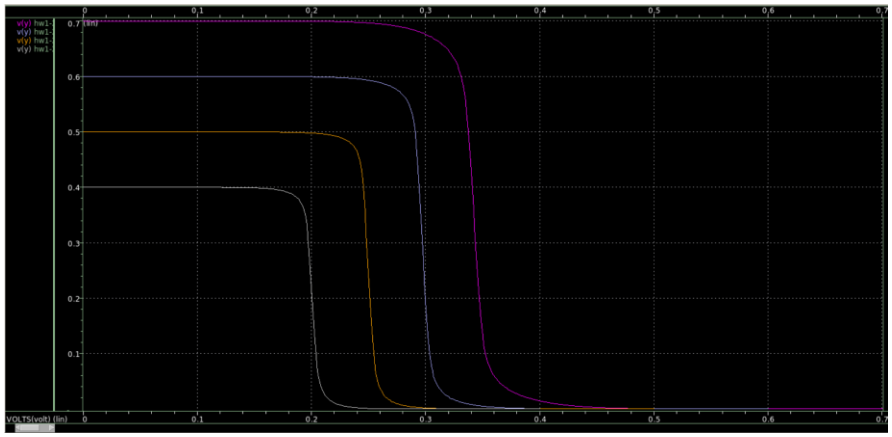
Exercise 1-2. Voltage Transfer Curve

1-2-1

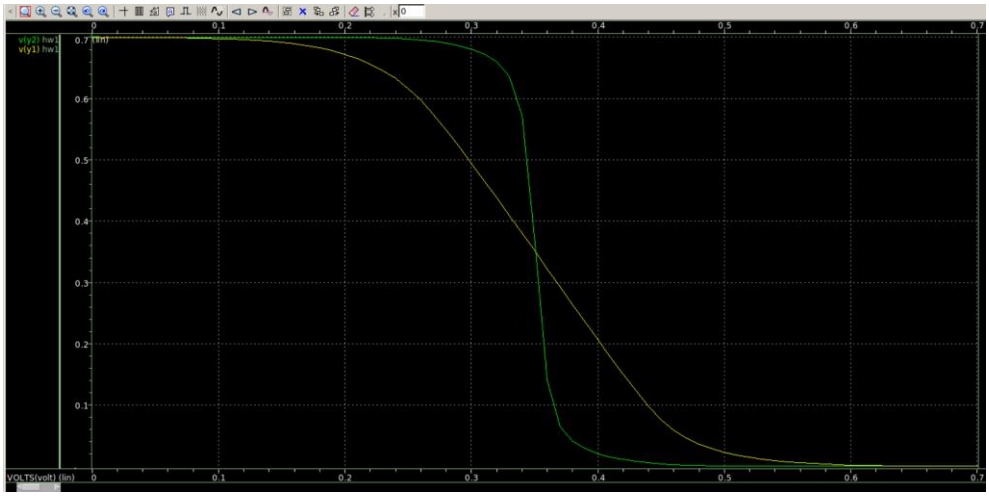
Smallest inverter



Largest inverter



1-2-2



綠色的為 FinFETs，黃色的為 Planer MOSs

註記:Ex1_2_1.sp 為第一題之程式，Ex1_2_2.sp 為第二題之程式

1-3. Power consumption

Planer MOSs inverter

1GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 78.1369n from= 0. to= 100.0000n
2GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 149.8346n from= 0. to= 50.0000n
4GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 292.9630n from= 0. to= 25.0000n

FinFETs inverter

1GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 662.2437n from= 0. to= 100.0000n
2GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 1.3246u from= 0. to= 50.0000n
4GHz	****** transient analysis tnom= 25.000 temp= 25.000 ****** power= 2.6420u from= 0. to= 25.0000n

註記: Ex1_3_fin.sp 為測量 FinFETs inverter power 之程式，Ex1_3_mos.sp 為 Planer MOSs inverter 為第二題之程式

1-4. Characteristics of NOR2/NAND2

NAND2

```
****** transient analysis tnom= 25.000 temp= 25.000 ******
trise= 334.2649p  targ=  2.9882n  trig=  2.6539n
tfall= 229.7244p  targ=  2.3688n  trig=  2.1390n
tphl= 113.0283p  targ=  2.2261n  trig=  2.1131n
tplh= 159.2338p  targ= 783.3612p  trig= 624.1274p
```

NOR2

```
****** transient analysis tnom= 25.000 temp= 25.000 ******
trise= 321.1143p  targ=  3.9764n  trig=  3.6553n
tfall= 127.5066p  targ=  2.2540n  trig=  2.1265n
tphl=  63.4204p  targ=  2.1772n  trig=  2.1138n
tplh= 154.0915p  targ=  1.7776n  trig=  1.6235n
```