

Module 2: Assignment, 7nm FinFET Device and Inverter Characterization

Name: Anil Kumar,

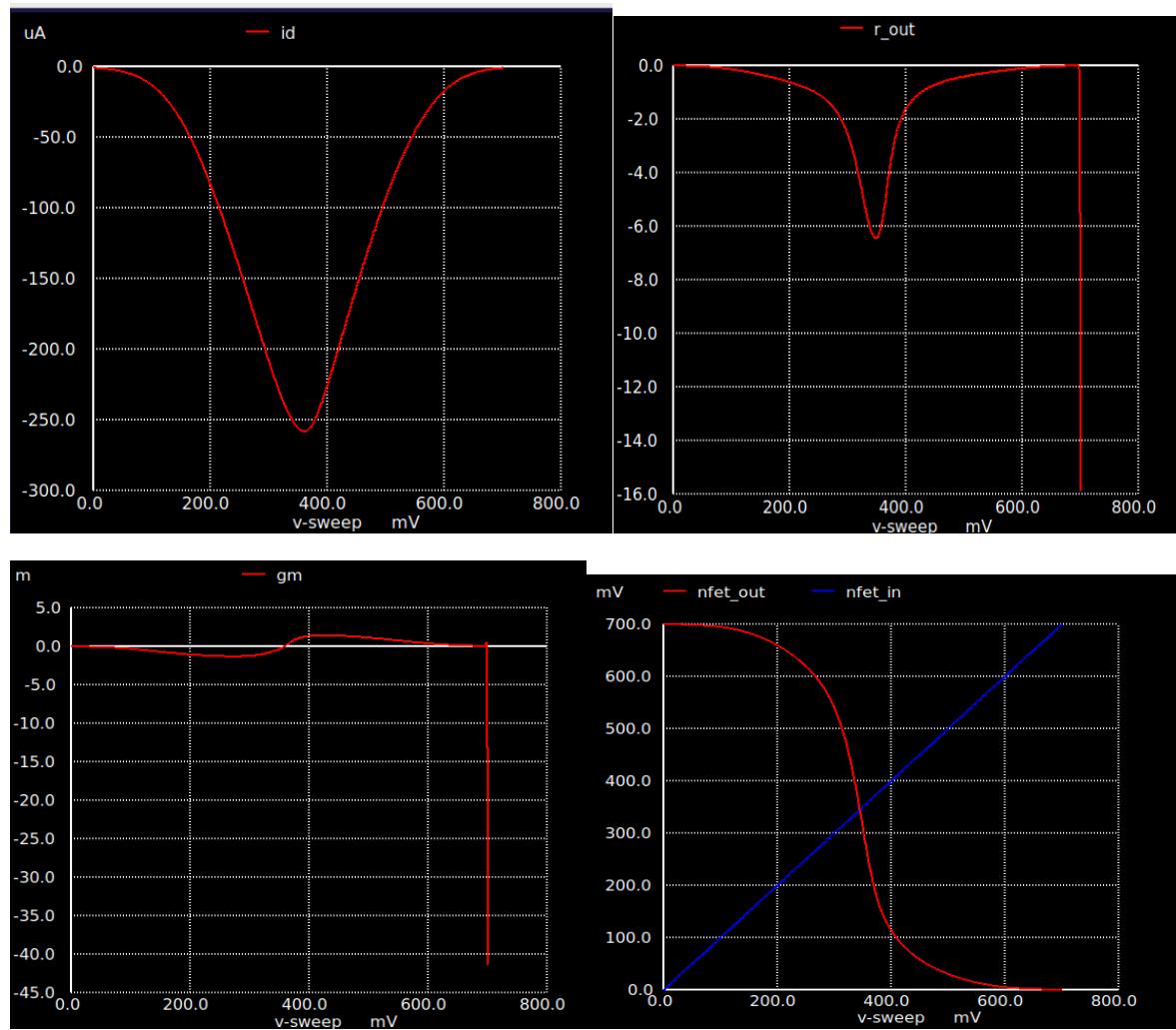
B. Tech: 4th Yr, Student (ECE), NIET Greater, Noida

Email: anilkumar945798@gmail.com

Results summary:

S.No	W/L (PMOS)		W/L (NMOS)		V _{th} (V)	I _d (A)	P (W)	t _{pd} (ps)	A _v	f (Hz)	G _{m_max} (mS)
1	L= 7n	nfin=14	L= 7n	nfin=14	0.344786	1.69E-15	1.185E-15	25.302	6.428	2.246E+10	1.23
2	L= 7n	nfin=16	L= 7n	nfin=16	0.344786	1.93E-15	1.36E-15	25.302	6.428	2.246E+10	1.41
3	L= 7n	nfin= 8	L= 7n	nfin=8	0.344786	9.68E-16	6.77E-16	25.302	6.428	2.246E+10	0.706
Vuniq	L= 7n	nfin=14	L= 7n	nfin=14	0.499	1.01E-14	7.1E-15	26.62	4.673	2.077E+10	129.8

Test case: L= 7n, nfin=16 → plots & report



Generated Reports:

```

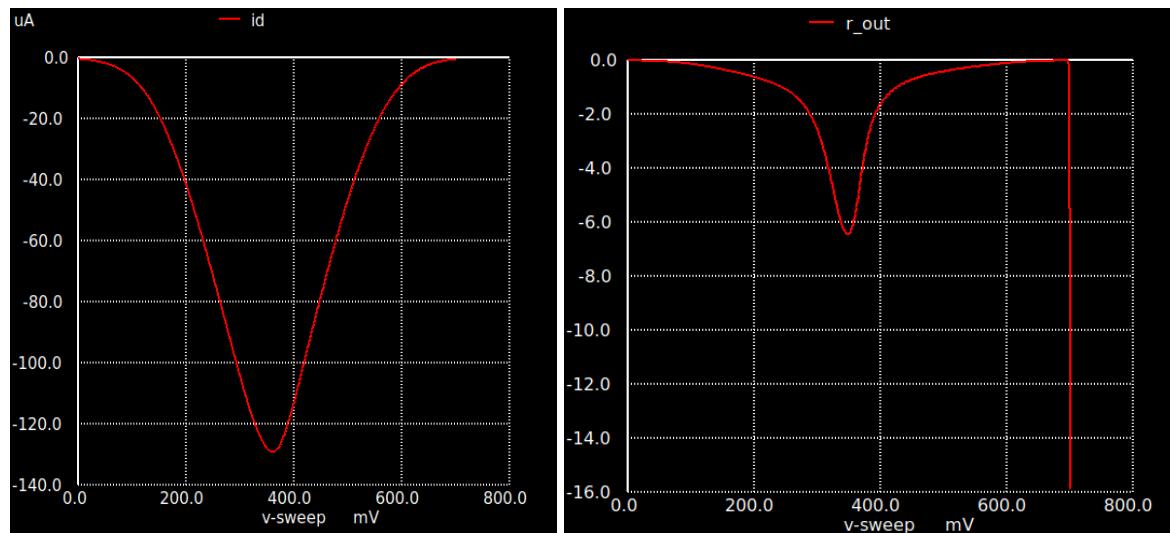
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Reference value : 5.36000e-01
No. of Data Rows : 701
v_th = 3.447862e-01
max_gain = 6.428448e+00 at= 3.500000e-01
vll = 3.488156e-01
voh = 3.190767e-01
vth = 3.510961e-01
vol = 3.044187e-01
v_th = 3.447862e-01
max_gain = 6.428448e+00
vll = 3.488156e-01
voh = 3.190767e-01
vth = 3.510961e-01
vol = 3.044187e-01
nnh = -3.20194e-02
nml = 4.439690e-02
gm_max = 1.412349e-03 at= 4.250000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node Voltage
--- -----
nfet_out 0.699647
nfet_in 0
vdd 0.7
v2#branch -9.2244e-07
v1#branch 8.25478e-12

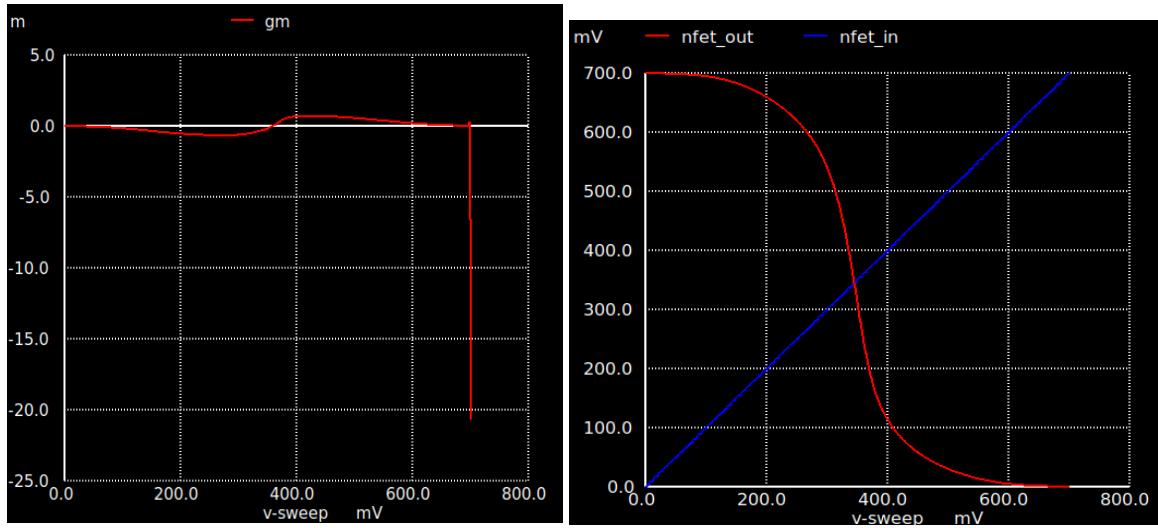
Reference value : 0.00000e+00
No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.560432e-11
id_pwr = -1.93606e-15 from= 2.00000e-11 to= 6.00000e-11
tp = 2.500000e-11
tpf = 2.560432e-11
tp = 2.530216e-11
id_pwr = -1.93607e-15
pwr = -1.35525e-15
power = 3.388114e-05
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node Voltage
--- -----
nfet_out 0.699647
nfet_in 0
vdd 0.7
v2#branch -9.2244e-07
v1#branch 8.25478e-12

Reference value : 4.30000e-11
No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.351715e-11
t_delay = 4.451715e-11
f = 2.246325e+10
series 24

```

Test case: L= 7n, nfin=8--> plots & report





Generated Reports:

```

Using SPARSE 1.3 as Direct Linear Solver
Reference value : 6.49000e-01
No. of Data Rows : 701
v_th = 3.447862e-01
max_gain = 6.428448e+00 at= 3.500000e-01
vll = 3.488156e-01
voh = 3.190767e-01
vh = 3.510961e-01
vol = 3.044188e-01
nmh = -3.20194e-02
nml = 4.439680e-02
gm_max = 7.061744e-04 at= 4.250000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node Voltage
-----
nfet_out 0.699647
nfet_in 0
vdd 0.7
v2#branch -4.6122e-07
v1#branch 4.12739e-12

Reference value : 5.45000e-11
No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.560432e-11
id_pwr = -9.68032e-16 from= 2.00000e-11 to= 6.00000e-11
tpr = 2.500000e-11
tpf = 2.560432e-11
tp = 2.530216e-11
id_pwr = -9.68032e-16
pwr = -6.77623e-16
power = 1.694057e-05
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node Voltage
-----
nfet_out 0.699647
nfet_in 0
vdd 0.7
v2#branch -4.6122e-07
v1#branch 4.12739e-12

No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.351715e-11
t_delay = 4.451715e-11
f = 2.246325e+10

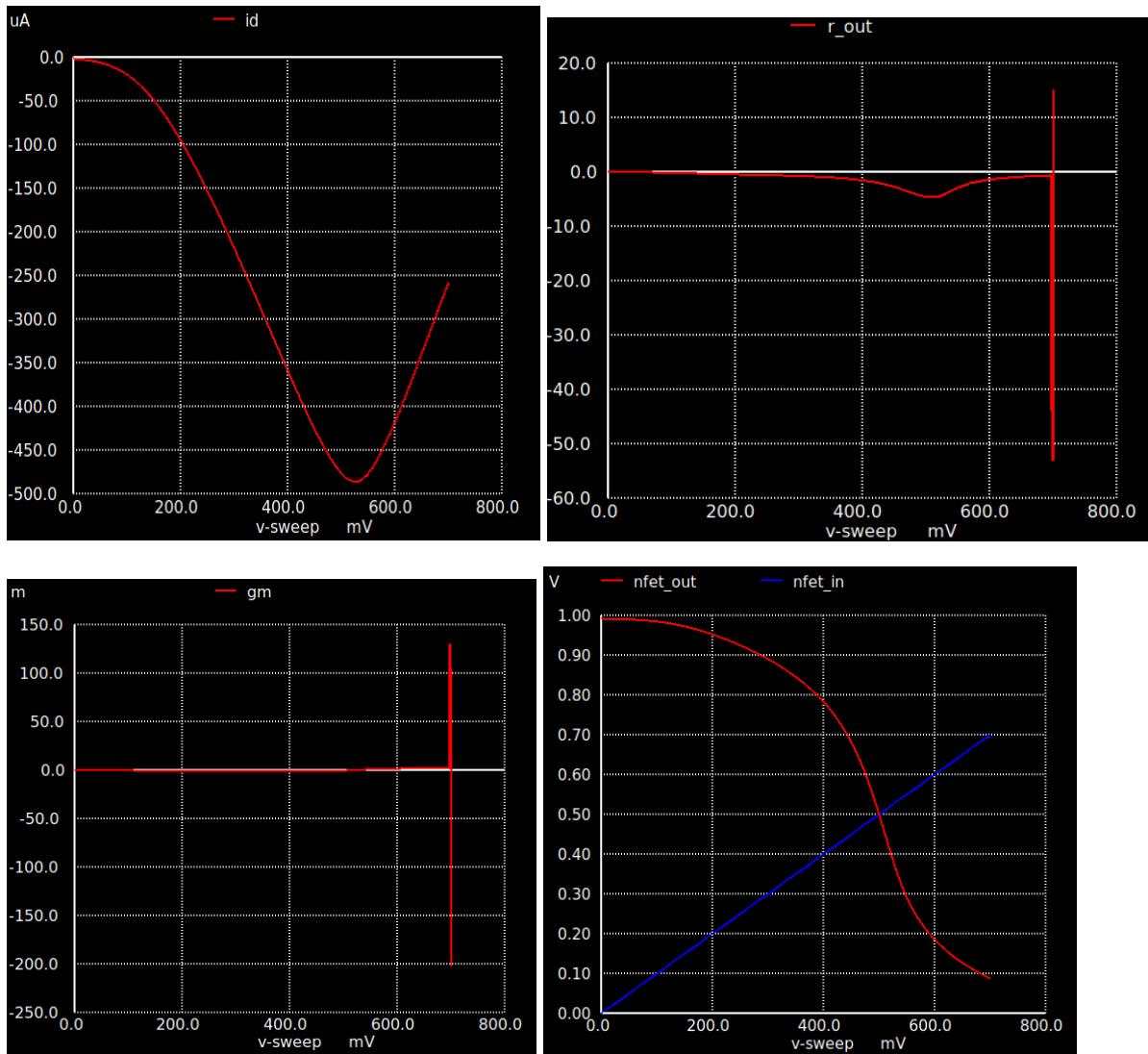
```

Test_Case with Vuniq Source

```

** sch_path: /home/maddy/asap_7nm_Xschem/inverter_vtc.sch
**.subckt inverter_vtc
Xpfet1 nfet_out nfet_in vdd vdd asap_7nm_pfet l=7e-009 nfin=14
Xnfet1 nfet_out nfet_in GND GND asap_7nm_nfet l=7e-009 nfin=14
V1 nfet_in GND pulse(0 0.7 20p 10p 10p 20p 500p 1)
V2 vdd Vuniq 0.7
Vx Vuniq GND 0.292 ##### Anil ASCII_value is 292#####

```



Generated Reports:

```

Using SPARSE 1.3 as Direct Linear Solver
Reference value : 6.47000e-01
No. of Data Rows : 701
v_th = 4.998321e-01
max_gain = 4.673490e+00 at= 5.110000e-01 id_pwr
vil = 5.088800e-01
voh = 4.580632e-01
vih = 5.126282e-01
vol = 4.405507e-01
v_th = 4.998321e-01
max_gain = 4.673490e+00
vil = 5.088800e-01
voh = 4.580632e-01
vih = 5.126282e-01
vol = 4.405507e-01
nmh = -5.45650e-02
nml = 6.832930e-02
gm_max = 1.298350e-01 at= 6.980000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000Node

Using SPARSE 1.3 as Direct Linear Solver
Reference value : 8.65000e-11
No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.825783e-11
tp = -1.01436e-14 from= 2.00000e-11 to= 6.00000e-11
power = 1.775135e-04
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node ----- Voltage ----- Voltage
---- nfet_out 0.991318
---- nfet_in 0 0
---- vdd 0.992 0.992
---- vuniq 0.292 0.292
---- vx#branch -1.76928e-06 -1.76928e-06
---- v2#branch -1.76928e-06 -1.76928e-06
---- v1#branch 1.45912e-11 1.45912e-11

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node ----- Voltage ----- Voltage
---- nfet_out 0.991318
---- nfet_in 0 0
---- vdd 0.992 0.992
---- vuniq 0.292 0.292
---- vx#branch -1.76928e-06 -1.76928e-06
---- v2#branch -1.76928e-06 -1.76928e-06
---- v1#branch 1.45912e-11 1.45912e-11
No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.713823e-11
t_delay = 4.813823e-11
f = 2.077351e+10

```