EE 212 (Electronic Devices Lab)

Experiment-5

MOS differential amplifier

Group Info:

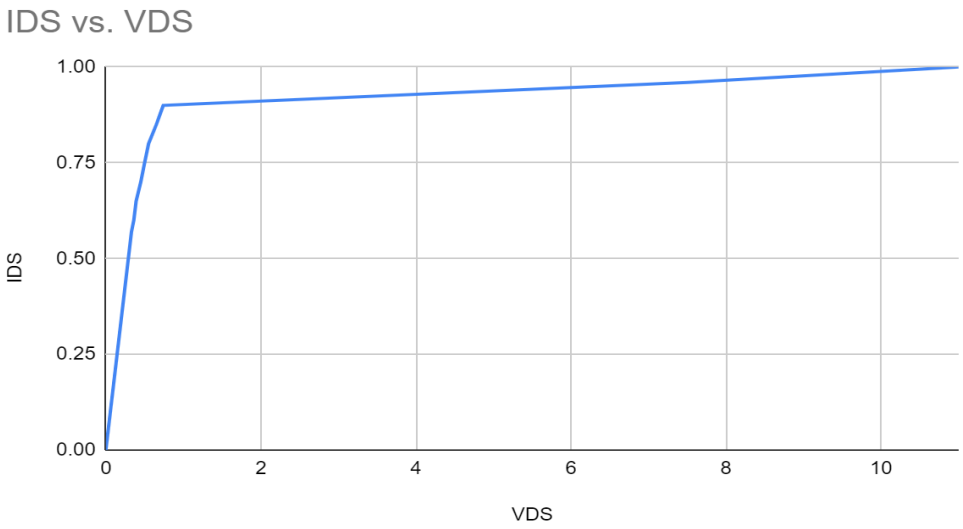
1. Manvi Baghel (200020025)
2. Shashi Prabha (200020043)

NMOS CURRENT MIRROR

I_{ds}-V_{ds} characteristics of NMOS current mirror where current is in mA and voltage is in volts

V_{DS} (V)	I_{DS} (mA)
0	0
0.33	0.57
0.36	0.6
0.39	0.65
0.45	0.7
0.5	0.75
0.55	0.8
0.65	0.85
0.74	0.9
7.5	0.96
11	1

Characteristics plotted:



Calculation of Output Impedance:
$R_{ds} = V_d / I_d$
Rds = 0.786 KOhm

Channel Length Modulation (λ):
$\lambda = 1 / R_{out} I_d$

$\lambda = 1.12V^{-1}$

CMOS differential amplifier

Resistors and capacitor value calculated is this

R_1=1 Kohm

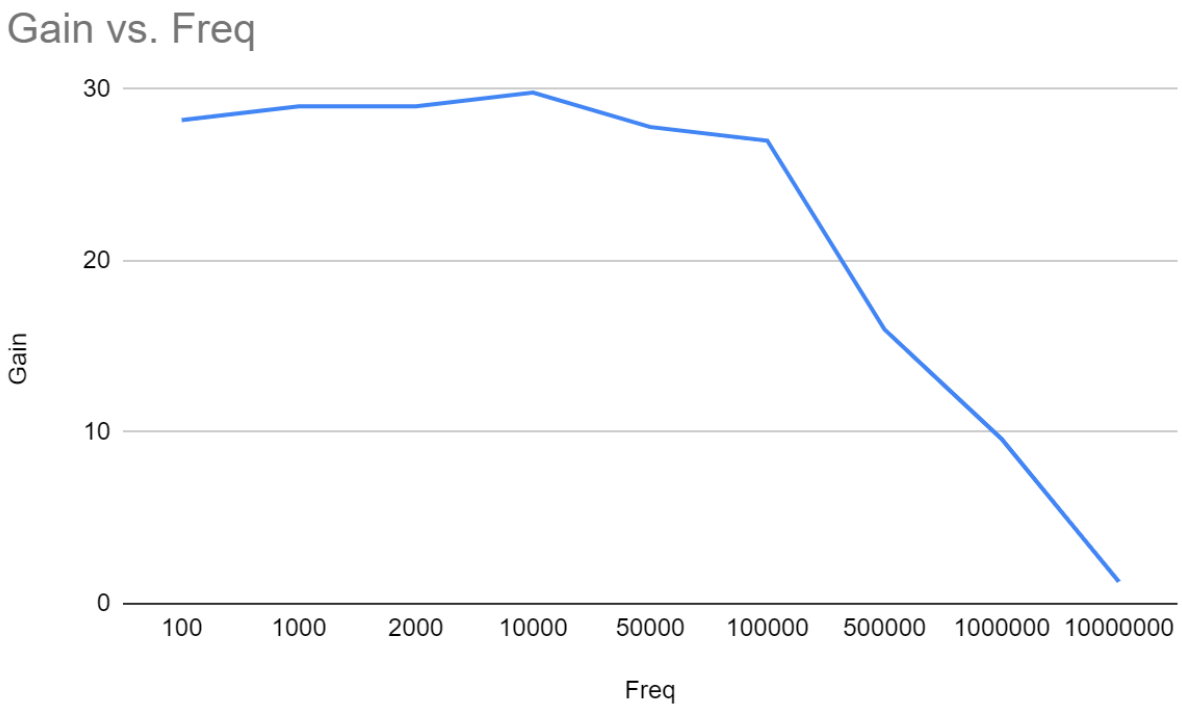
C = 4.7 µF

we got the gain of the amplifier to be around 3.2 with resistor, and

we got the gain of the amplifier to be around 27-29 when using the inductor,

Observation Table

Freq	V_ip-p(V)	V_op-p(V)	Gain	Phase Diff(deg)
100	0.05	1.41	28.2	180
1000	0.05	1.45	29	40
2000	0.05	1.45	29	0
10000	0.05	1.49	29.8	-5
50000	0.05	1.39	27.8	-5
100000	0.05	1.35	27	-3
500000	0.05	0.8	16	-15
1000000	0.05	0.48	9.6	-15
10000000	0.05	0.064	1.28	-20



Discussion:

Manvi:

We understood implementation of CMOS differential amplifier.We calculated values of resistances and observed the gains and please difference. It was a mind boosting experiment where we learnt about CMOS gates.

Shashi:
In this experiment we learnt To characterize an NMOS current mirror circuit and a CMOS differential input to single ended output amplifier,we measured IDS for different values of VDS and plot the characteristics on the graph, through this we calculated channel length modulation parameter, measured the gain of the amplifier with resistor and with inductor , we got different plots on oscilloscope this is fully hardware based experiment many new thing we learnt about.