C2 REVIEW ASSIGNMENT

CIRCUIT SIMULATIONS WITH SPICE

TEJAS MESHRAM

MEC2021015

MTECH

1ST SEM ECE

IIIT ALLAHABAD

Question 1

Find out the Voltage gain of the amplifier of the circuit shown in Fig.1. Choose the component and transistor parameters in the SPICE program. Choose the input DC bias. Provide the SPICE code and results (AC and Transient both).

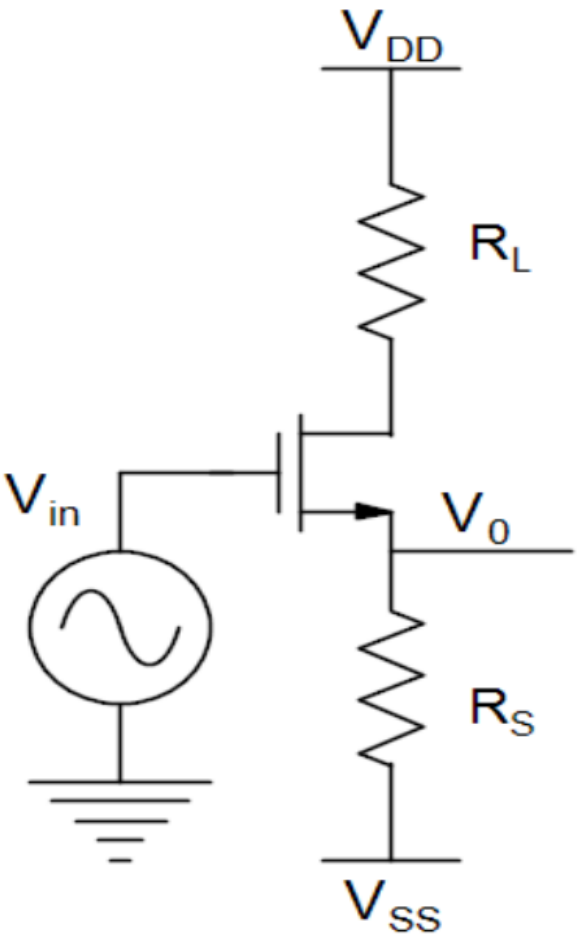
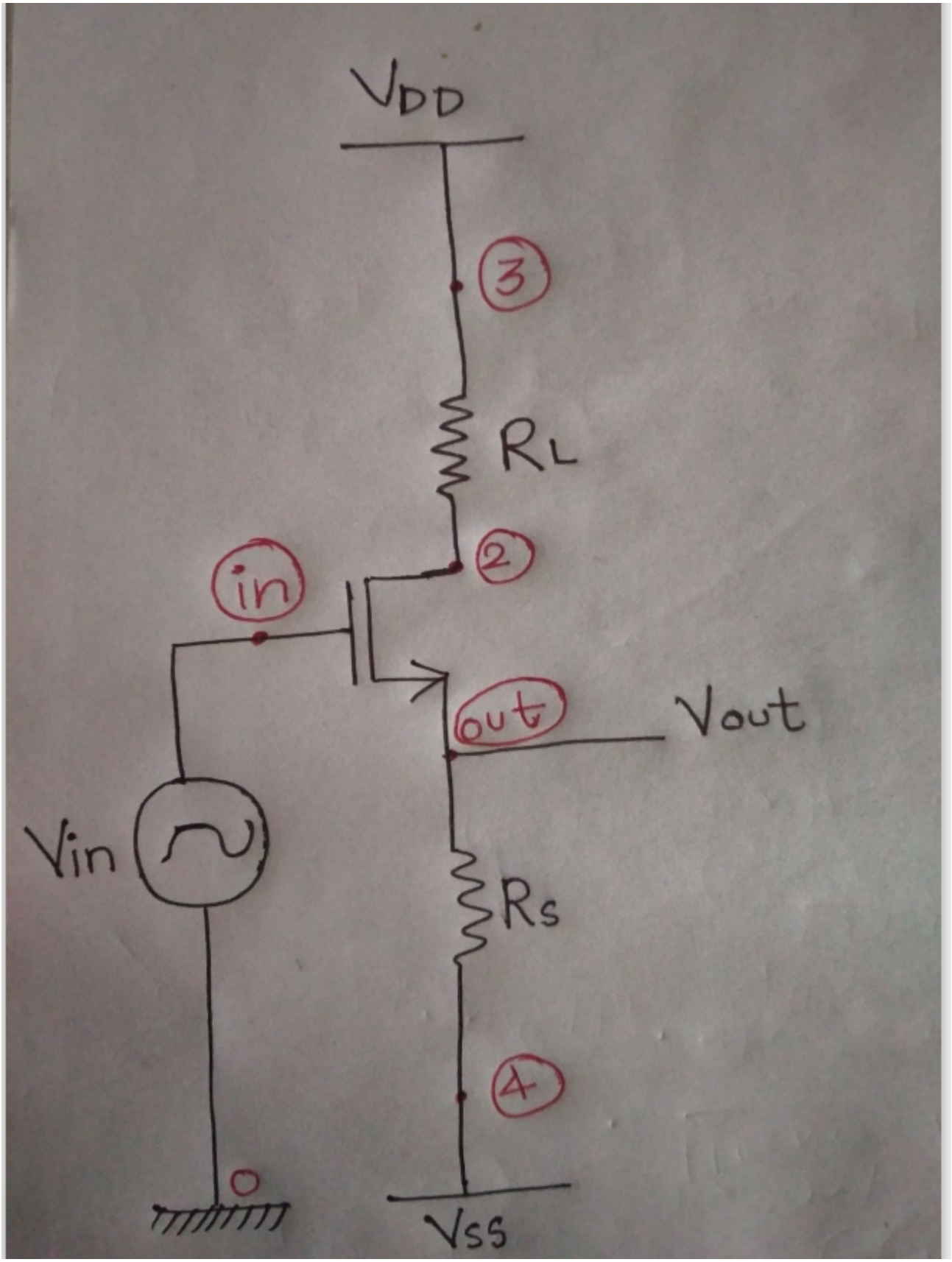


Fig.1: Schematic of Amplifier

Mentioning nodes for Fig.1

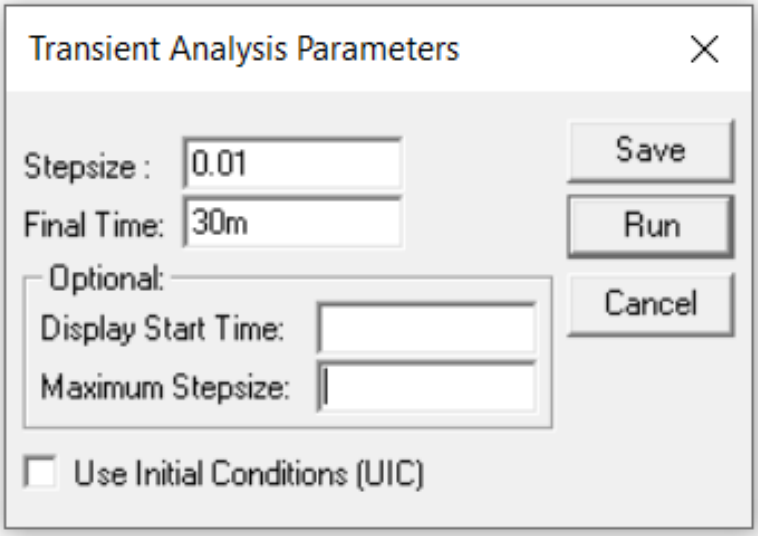


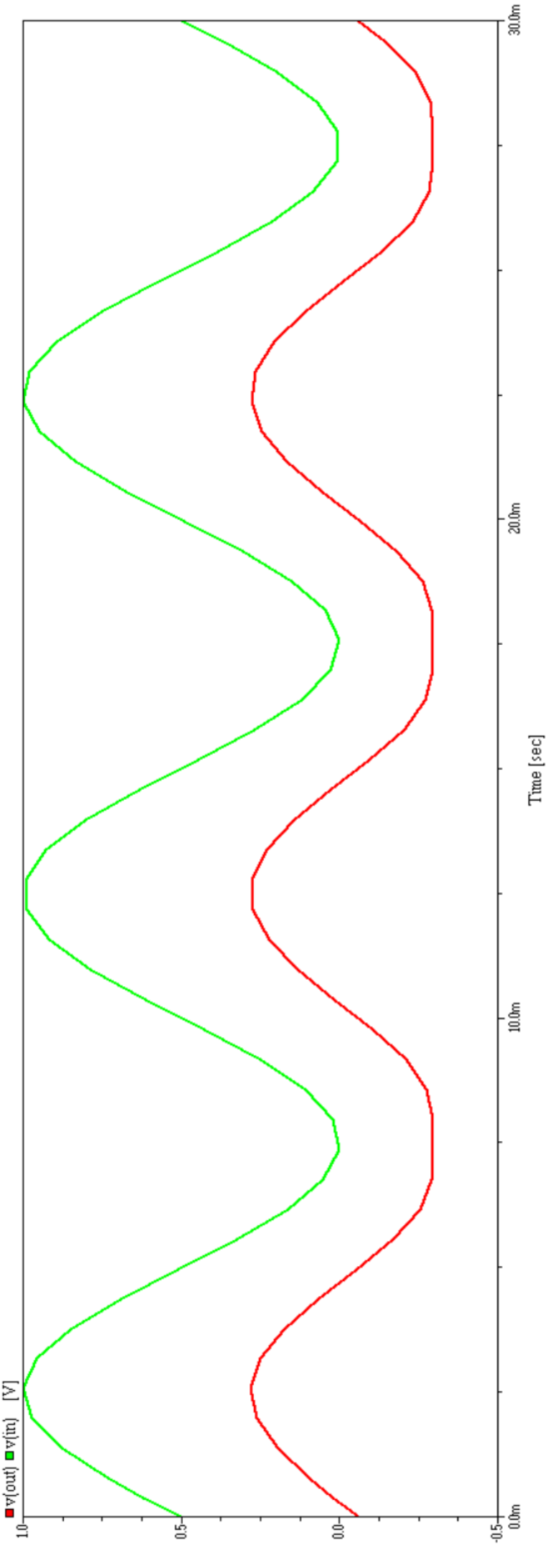
Solution 1

> WRITING THE NETLIST

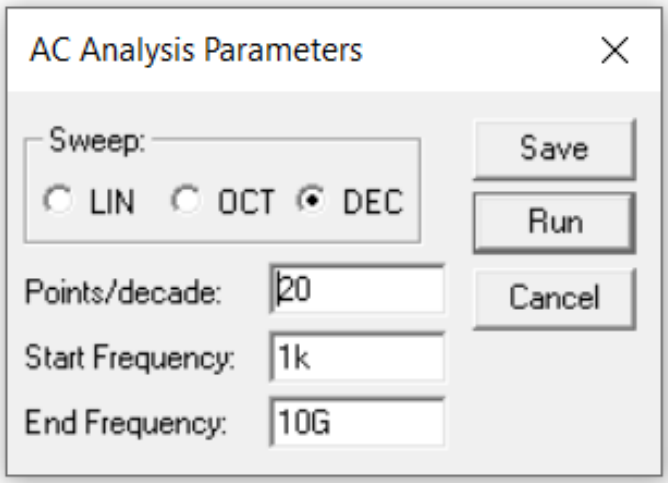
```
********** Question 1 **********

Vin in 0 dc 0.0 ac 1.0 sin(0.5 0.5 0.1khz 0 0)
Vdd 3 0 2.2
Vss 0 4 0.3

RL 2 3 1k
Rs out 4 1.5k

Cc1 out 0 100p

M1 2 in out 0 ntype l=180nm w=18000nm

.plot ac Vdb(out,in)
.plot V(out) V(in)
.MODEL ntype NMOS ( LEVEL   = 49
+VERSION = 3.1                TNOM    = 27
+XJ      = 1E-7               NCH     = 2.3549E17
+K1      = 0.5826058          K2      = 6.016593E-3
+K3B     = 1.4046112          W0      = 1E-7
+DVT0W   = 0                  DVT1W   = 0
+DVT0    = 1.3156832          DVT1    = 0.397759
+U0      = 280.5758609        UA      = -1.208176E-9
+UC      = 5.340577E-11       VSAT    = 9.601364E4
+AGS     = 0.4008594          B0      = -3.73715E-9
+KETA    = -1.136459E-3       A1      = 2.580625E-4
```

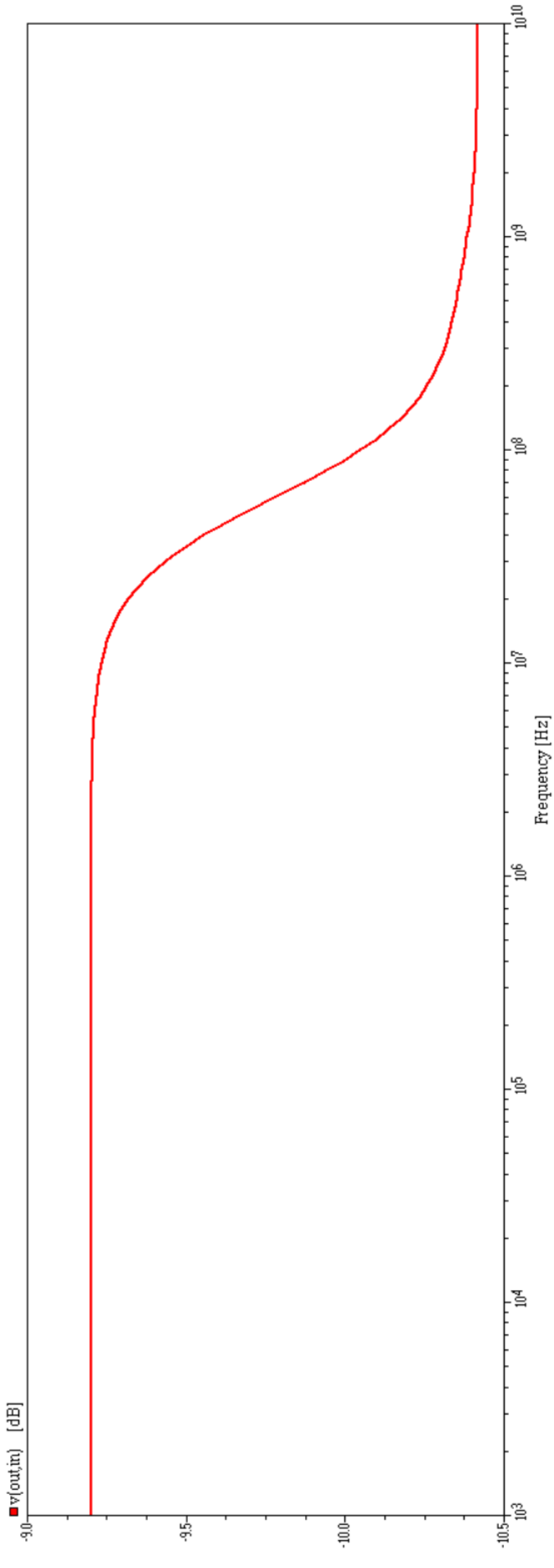
> TRANSIENT ANALYSIS





> AC output voltage gain analysis





Question 2

Find out the Voltage gain of the amplifier of the circuit shown in Fig.2. Choose the component and transistor parameters in the SPICE program. Provide the SPICE code and results (AC and Transient both).

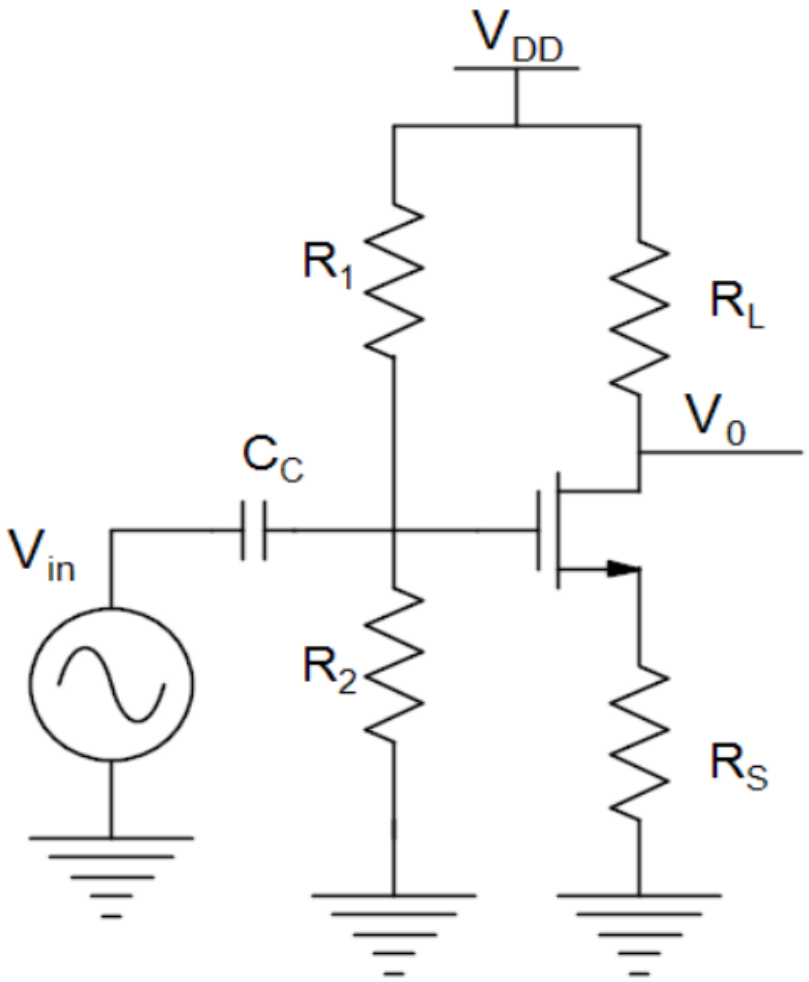
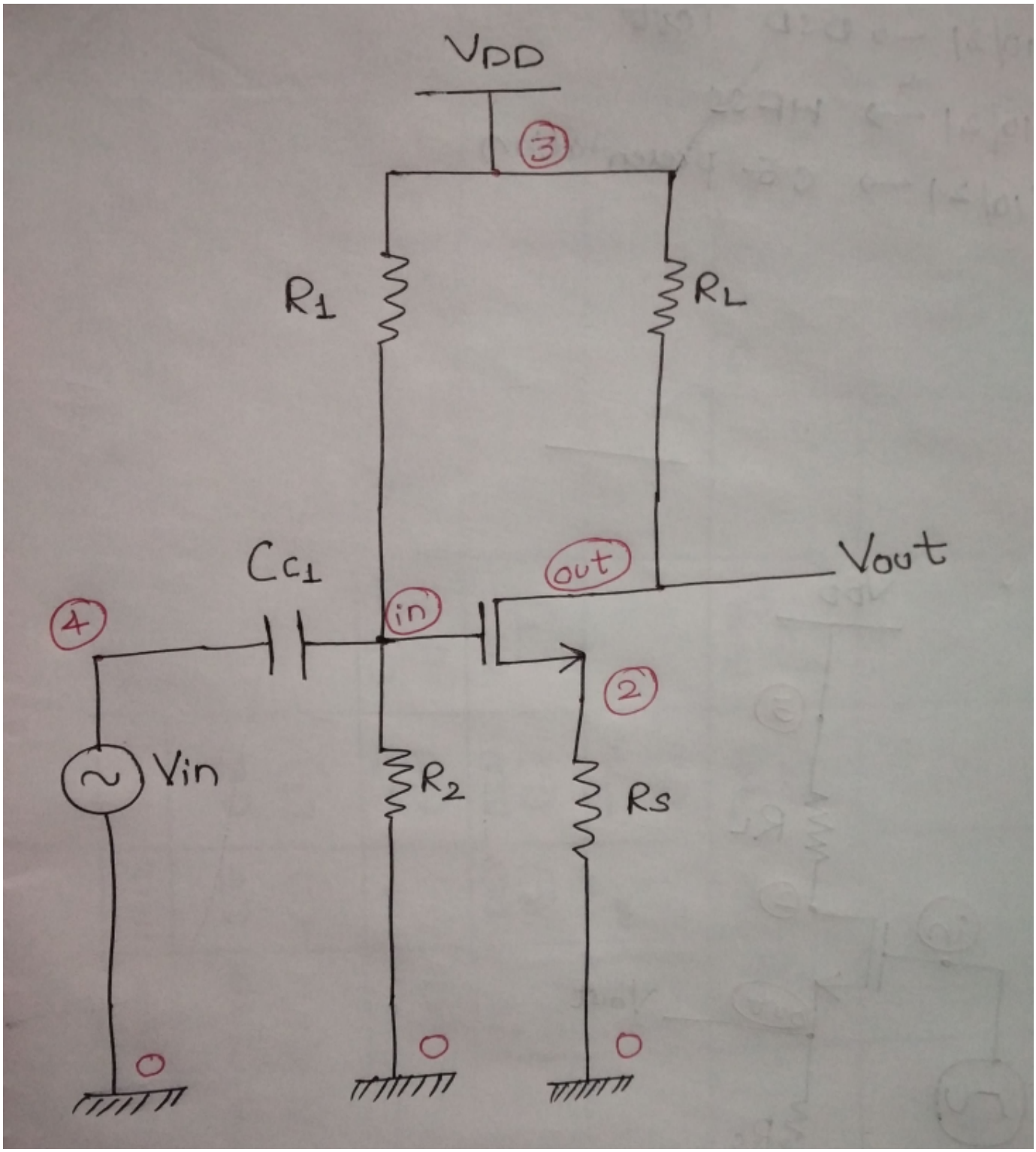


Fig.2: Schematic of Amplifier

Mentioning nodes for Fig.2



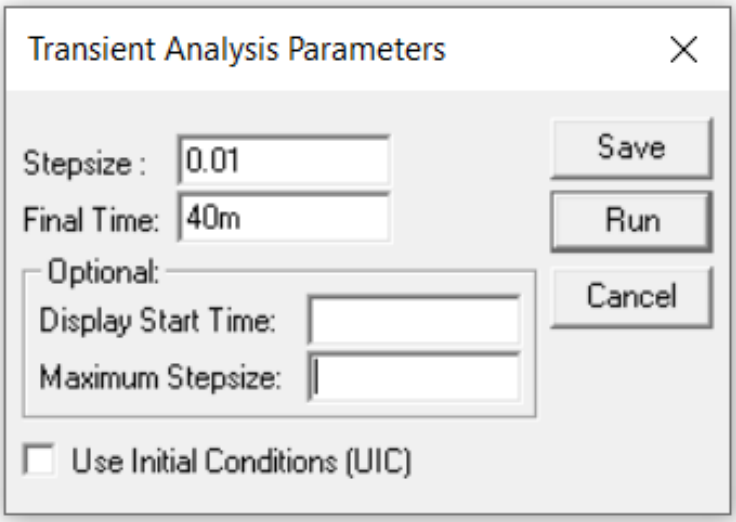
Solution 2

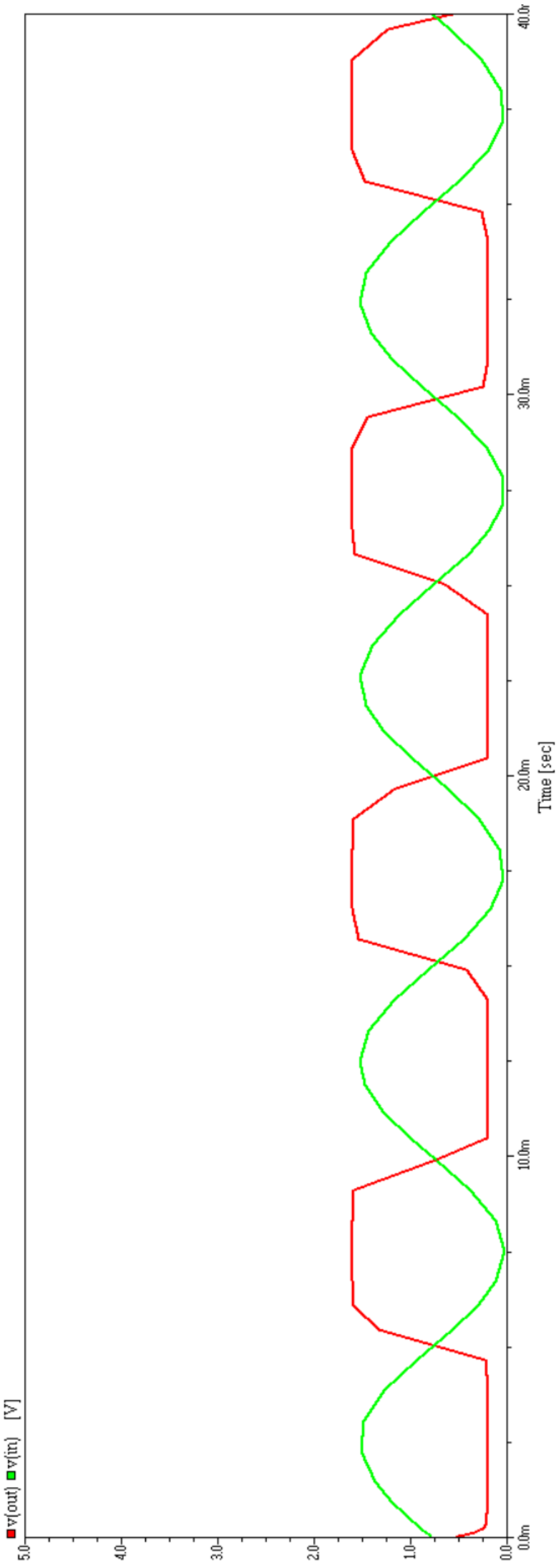
> WRITING THE NETLIST

```
********** Question 2 ***************

Vdd 3 0 dc 1.6
Vin 4 0 dc 0.0 ac 1.0 sin(0.75 0.75 0.1khz 0 0)

R1 in 3 180k
R2 in 0 170k
RL out 3 4k
Rs 2 0 0.5k

M1 out in 2 0 ntype l=180nm w=28000nm

Cc1 in 4 0.5
Cc2 out 0 12p

.plot ac vdb(out,in)
.plot v(out) v(in)
.MODEL ntype NMOS ( LEVEL    = 49
+VERSION = 3.1              TNOM     = 27
+XJ      = 1E-7             NCH      = 2.3549E17
+K1      = 0.5826058        K2       = 6.016593E-3
+K3B     = 1.4046112        W0       = 1E-7
+DVT0W   = 0                DVT1W    = 0
+DVT0    = 1.3156832        DVT1     = 0.397759
```

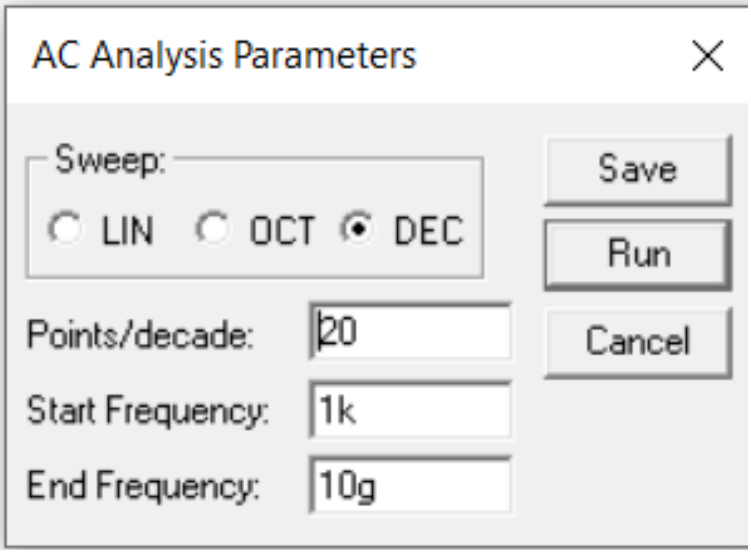
File Format: AIM-Spice

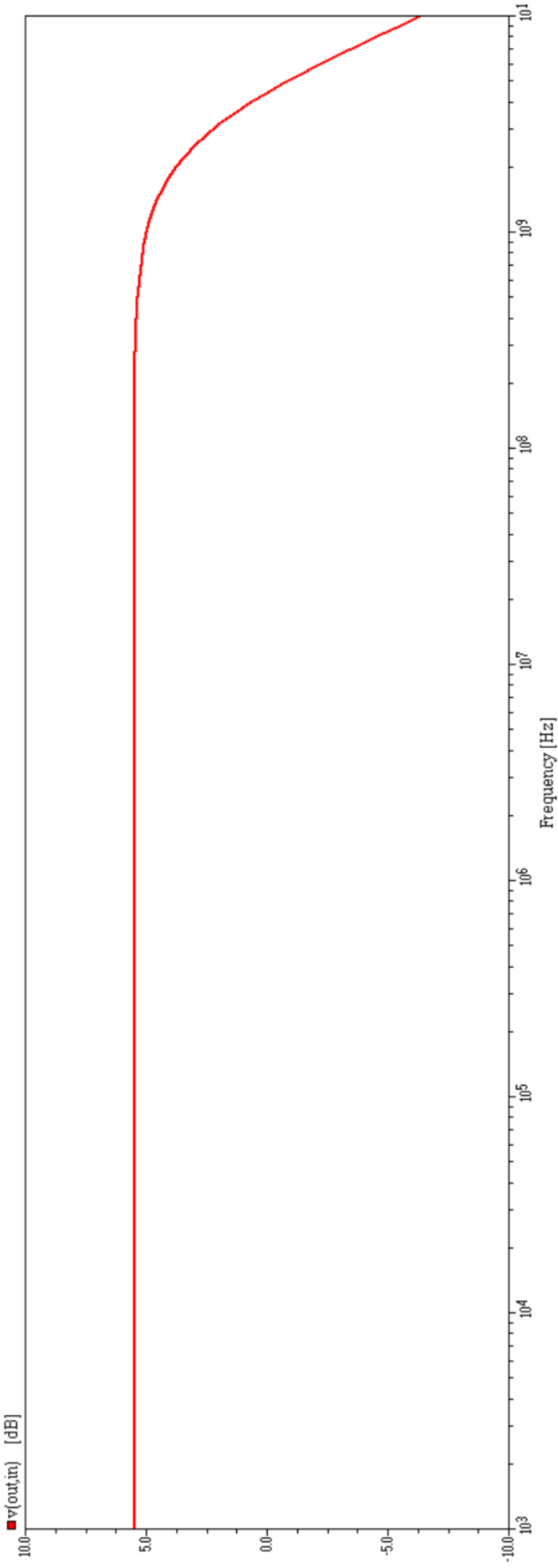
> TRANSIENT ANALYSIS





> AC output voltage gain analysis





Question 3

Find out the Voltage gain of the amplifier of the circuit shown in Fig.3 by removing the coupling capacitor, CC and incorporating negative bias. Choose the component and transistor parameters in the SPICE program. Provide the SPICE code and results (AC and Transient both).

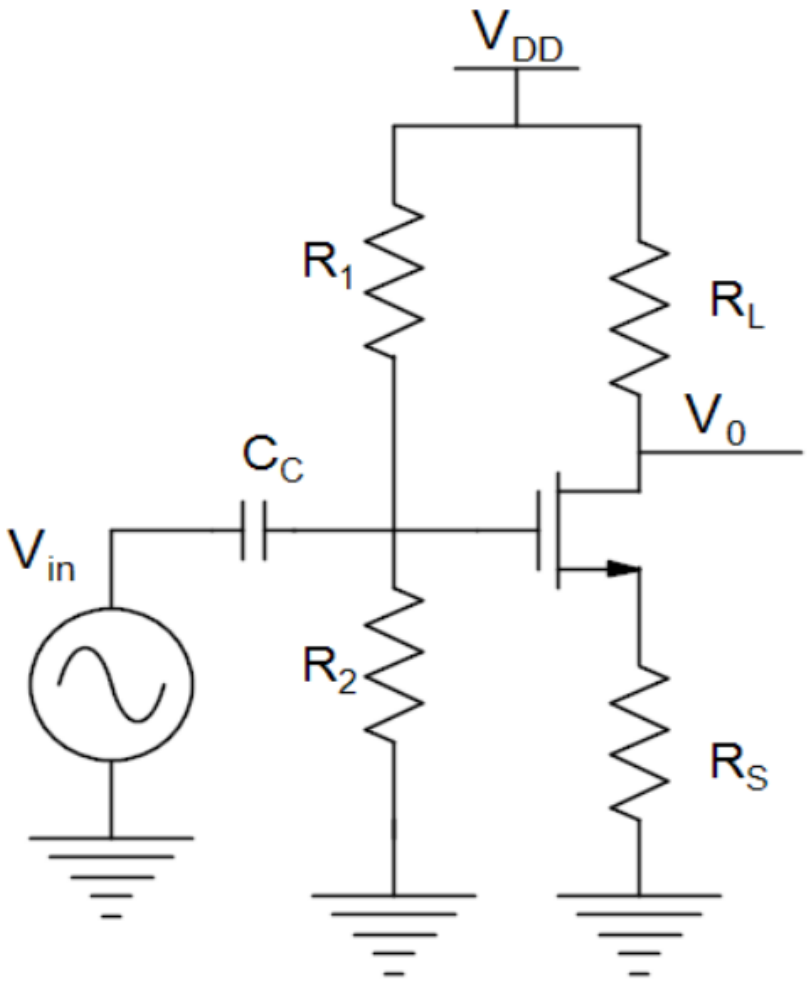
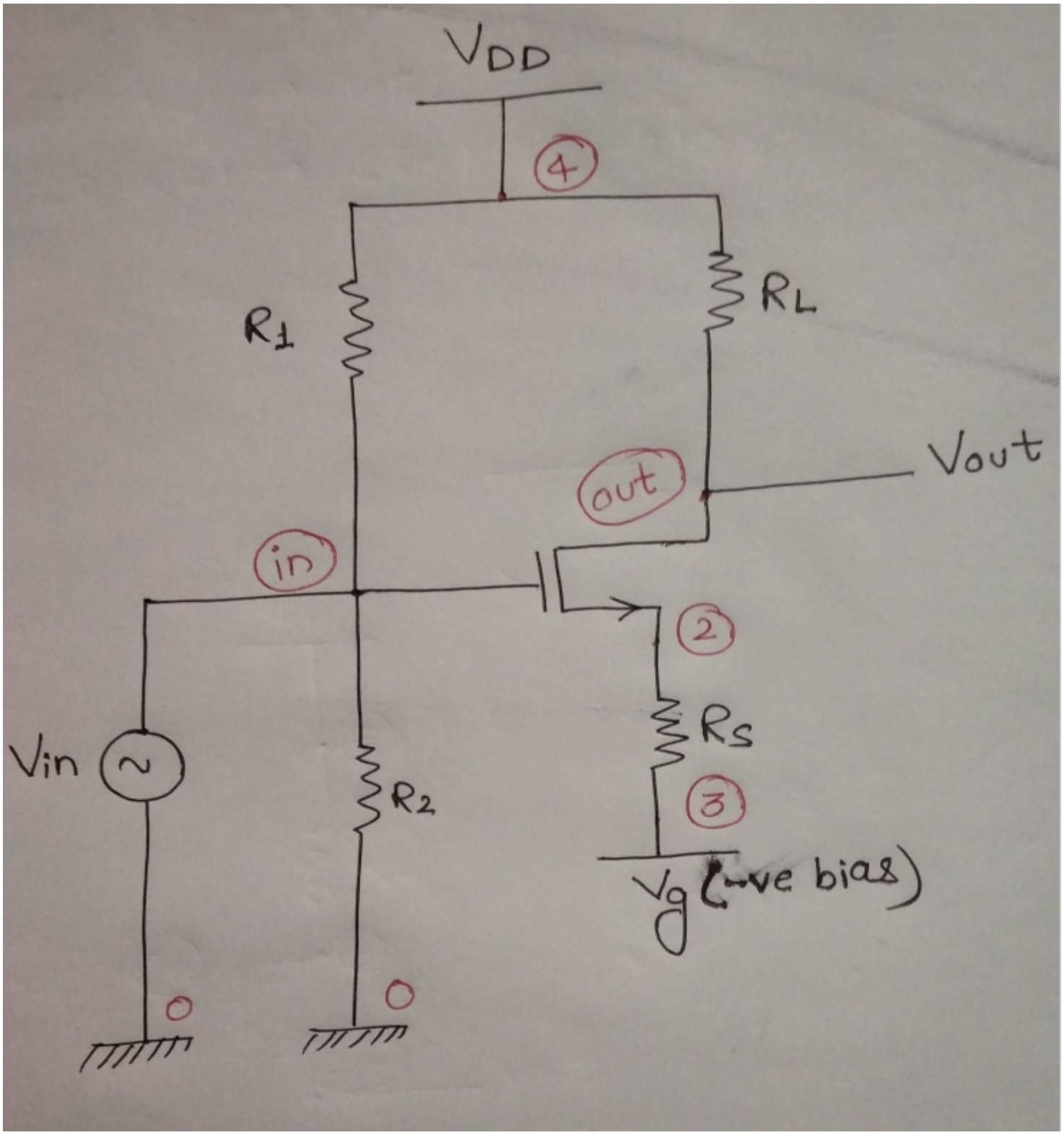


Fig.3: Schematic of Amplifier

Mentioning nodes for Fig.3

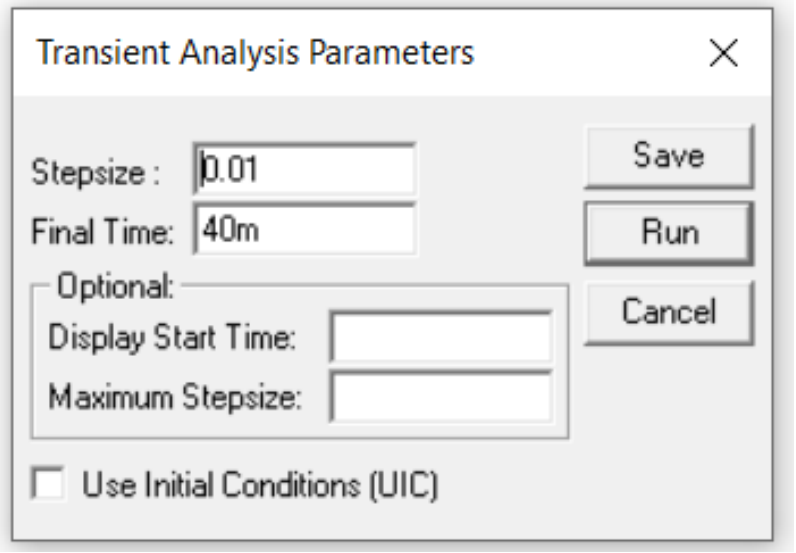


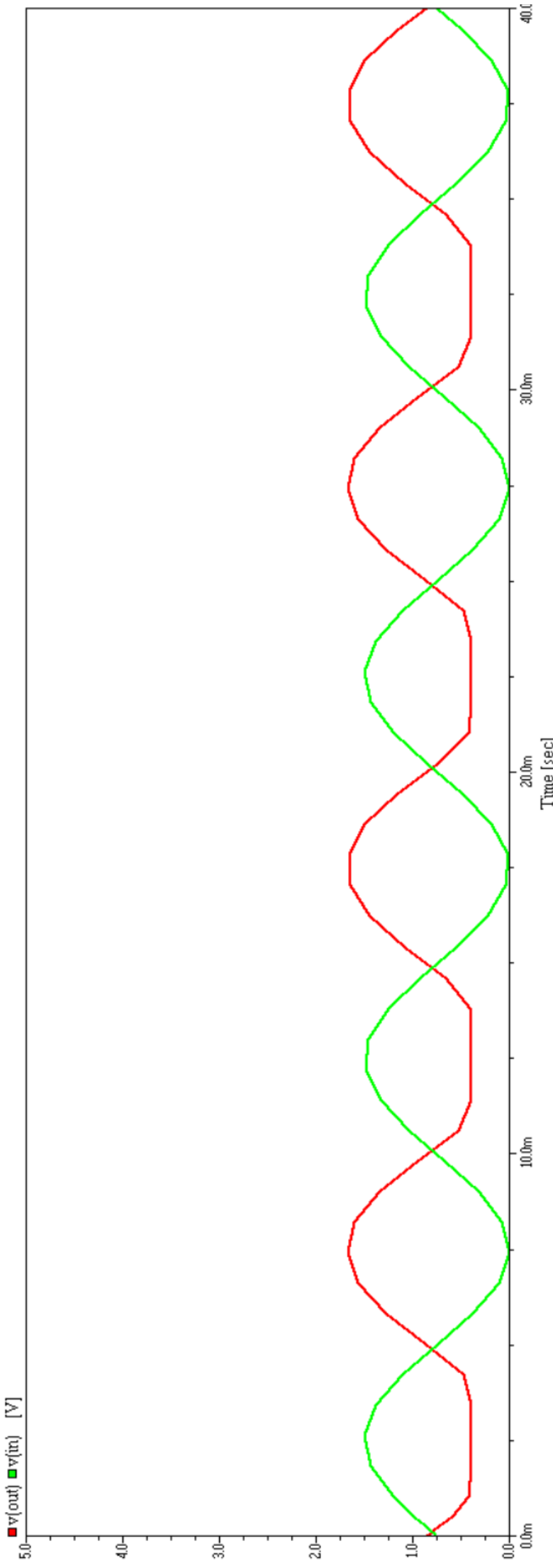
Solution 3

> WRITING THE NETLIST

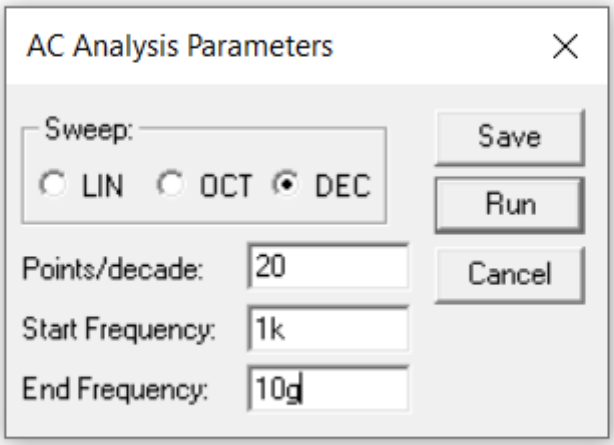
```
********** Question 3 **********

Vdd 4 0 1.8
Vg 0 3 0.5
Vin in 0 dc 0.0 ac 1.0 sin(0.75 0.75 0.1khz 0 0)

R1 in 4 80k
RL out 4 2k
R0 in 0 130k
Rs 2 3 1.2k

M1 out in 2 0 ntype l=180nm w=24000nm

Cc out 0 1f

.plot ac Vdb(out,in)
.plot v(out) v(in)

.Model ntype NMOS (LEVEL   = 49
+VERSION = 3.1                TNOM    = 27
+XJ      = 1E-7               NCH     = 2.3549E17
+K1      = 0.5826058          K2      = 6.016593E-3
+K3B     = 1.4046112          W0      = 1E-7
+DVT0W   = 0                  DVT1W   = 0
```

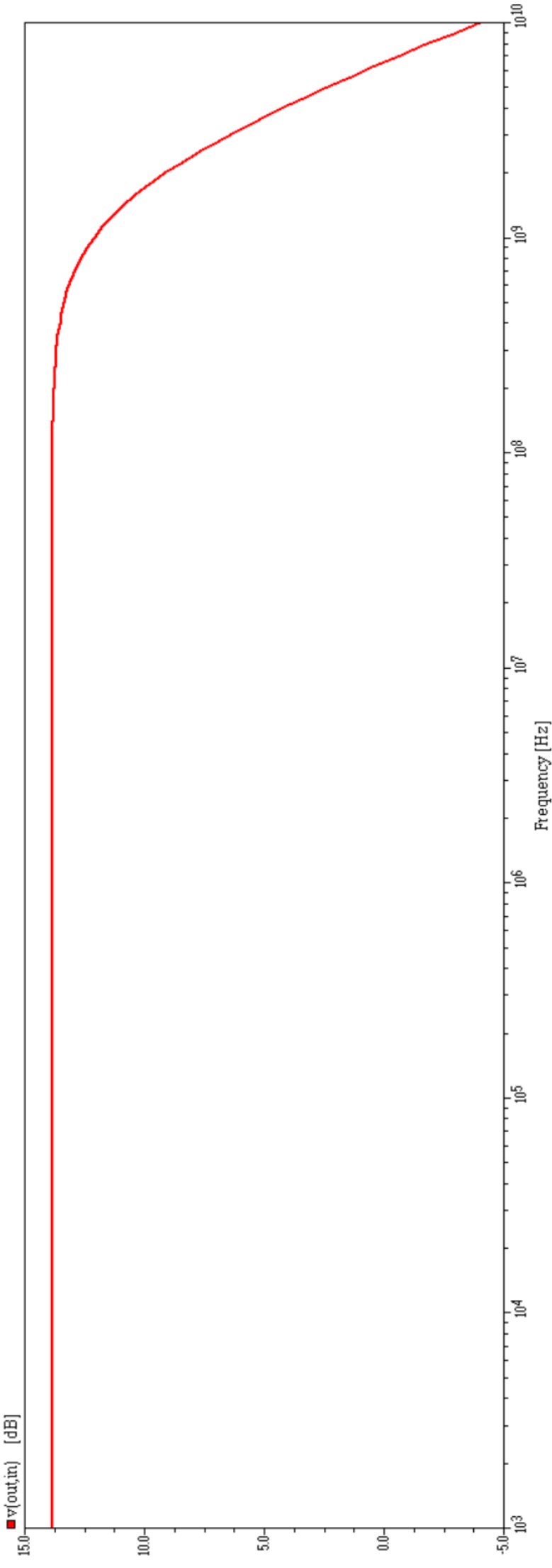
> TRANSIENT ANALYSIS





> AC output voltage gain analysis





You have reached end of this document

Thank you

MEC2021015 Tejas Meshram