C2 REVIEW ASSIGNMENT

CIRCUIT SIMULATIONS WITH SPICE

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MTECH

1ST SEM ECE

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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).

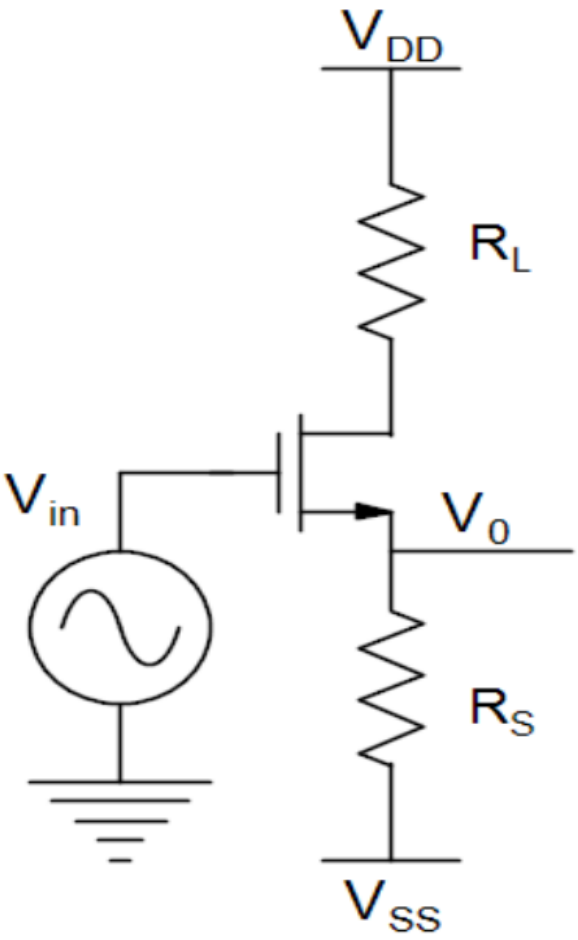
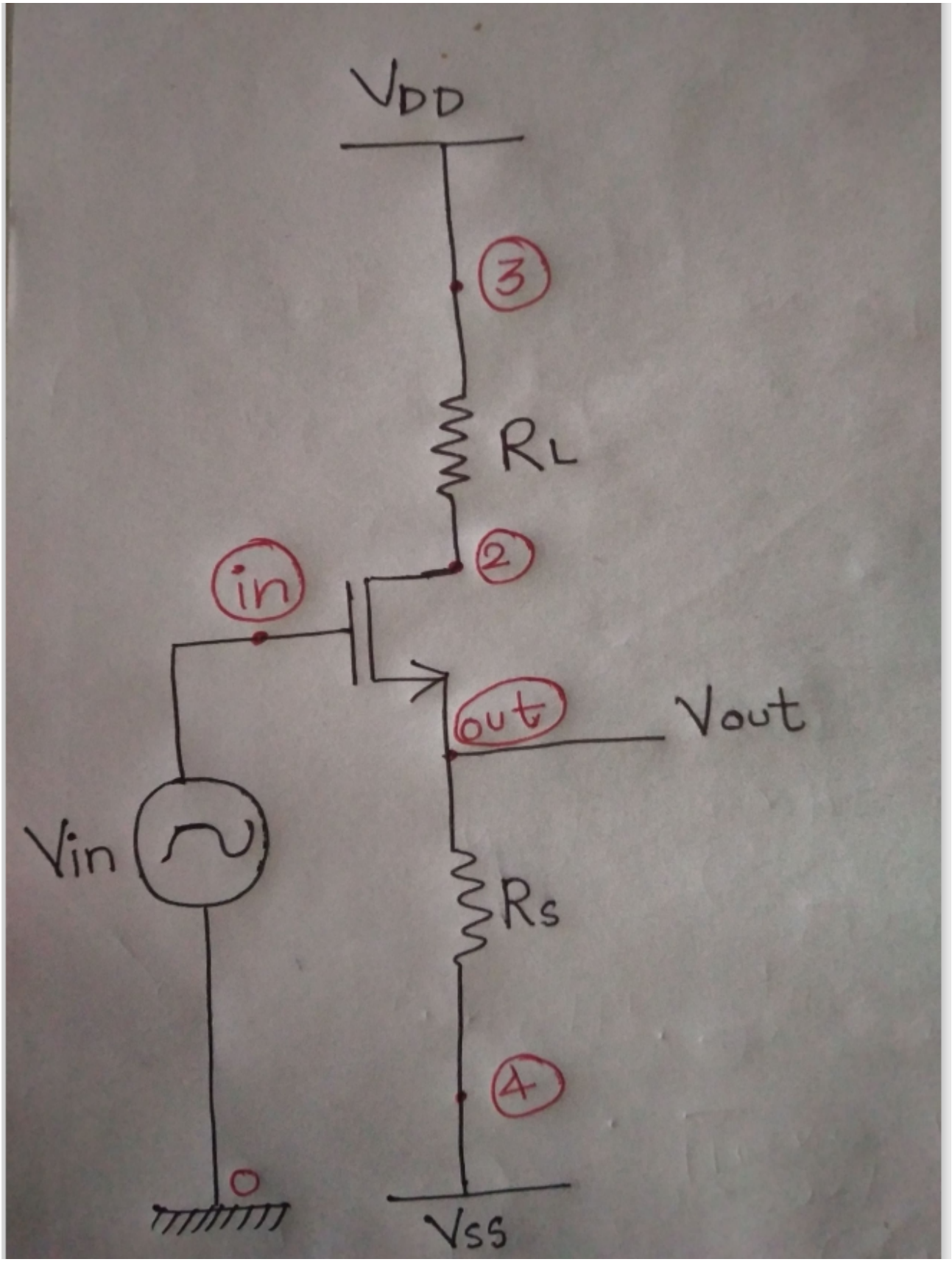


Fig.1: Schematic of Amplifier

Mentioning nodes for Fig.1

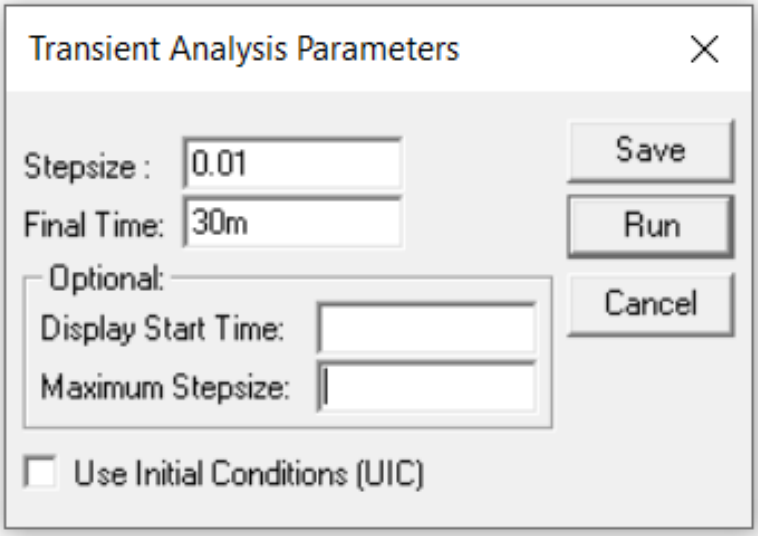


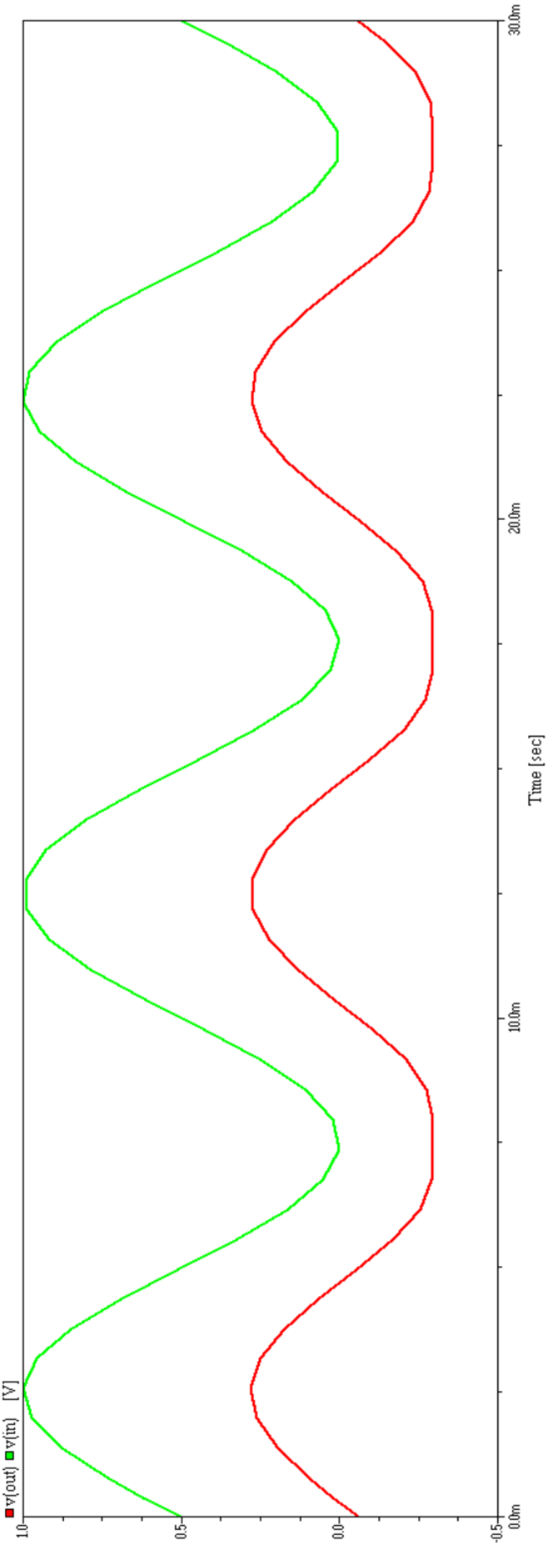
Solution 1

> WRITING THE NETLIST

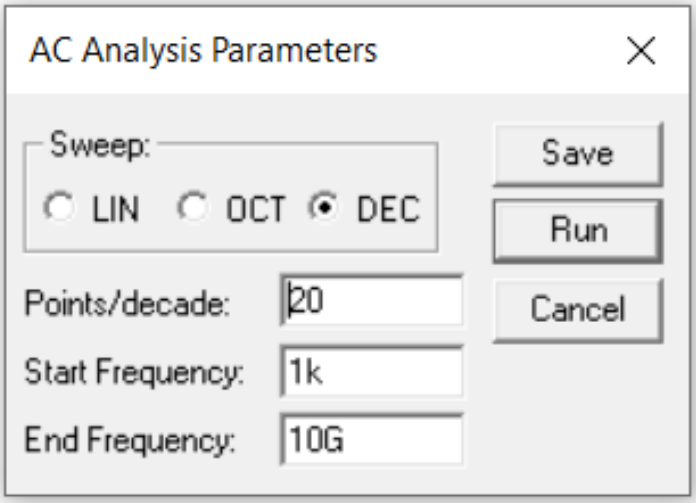
```
********** Question 1 **********

Vin in 0 ac 1.0 sin(0.75 0.75 0.1khz 0 0)
Vdd 3 0 1.6
Vss 0 4 0.5

RL 2 3 12k
Rs out 4 5k

M1 2 in out 0 ntype l=180nm w=480nm



.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-
+K3B     = 1.4046112          W0       = 1E-7
+DVT0W   = 0                  DVT1W    = 0
+DVT0    = 1.3156832          DVT1     = 0.397759
+U0      = 280.5758609        UA       = -1.208176E
+UC      = 5.340577E-11       VSAT     = 9.601364E4
+AGS     = 0.4008594          B0       = -3.73715E-
+KETA    = -1.136459E-3       A1       = 2.580625E-
```

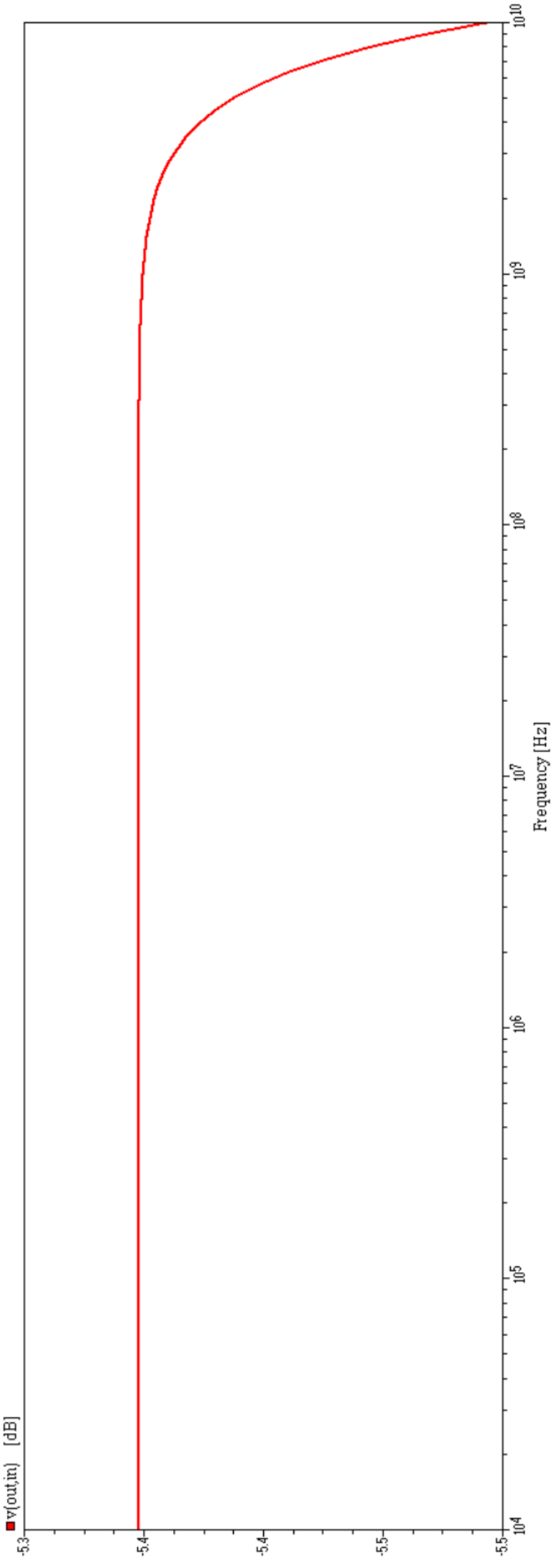
> TRANSIENT ANALYSIS





> 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).

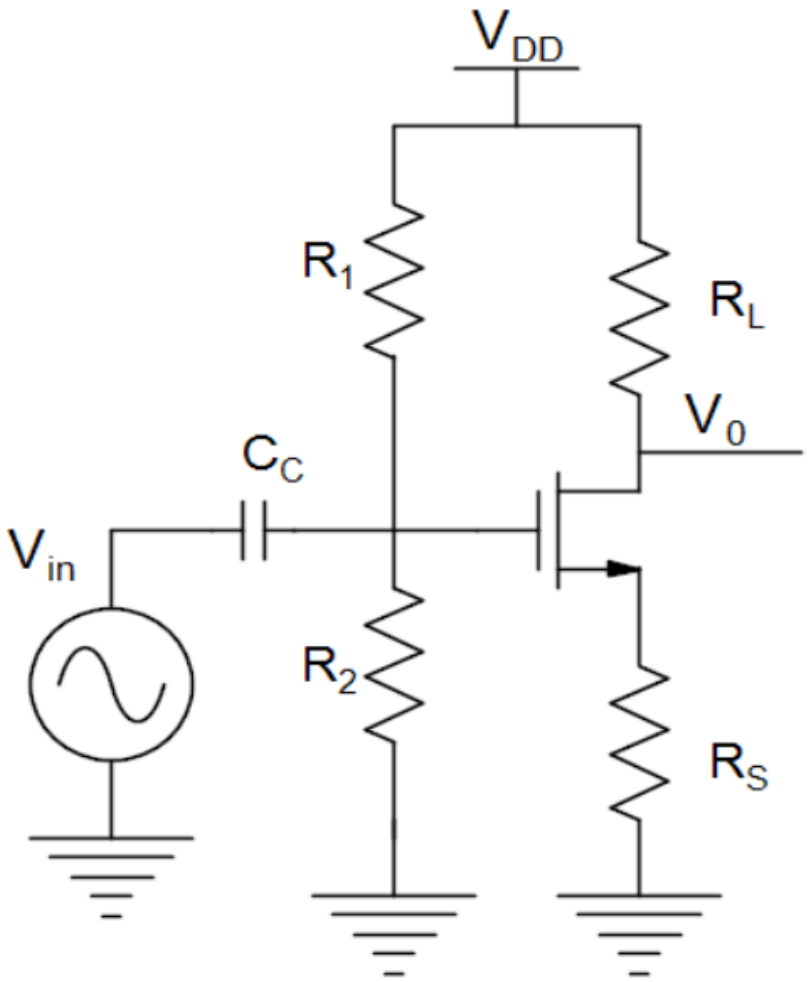
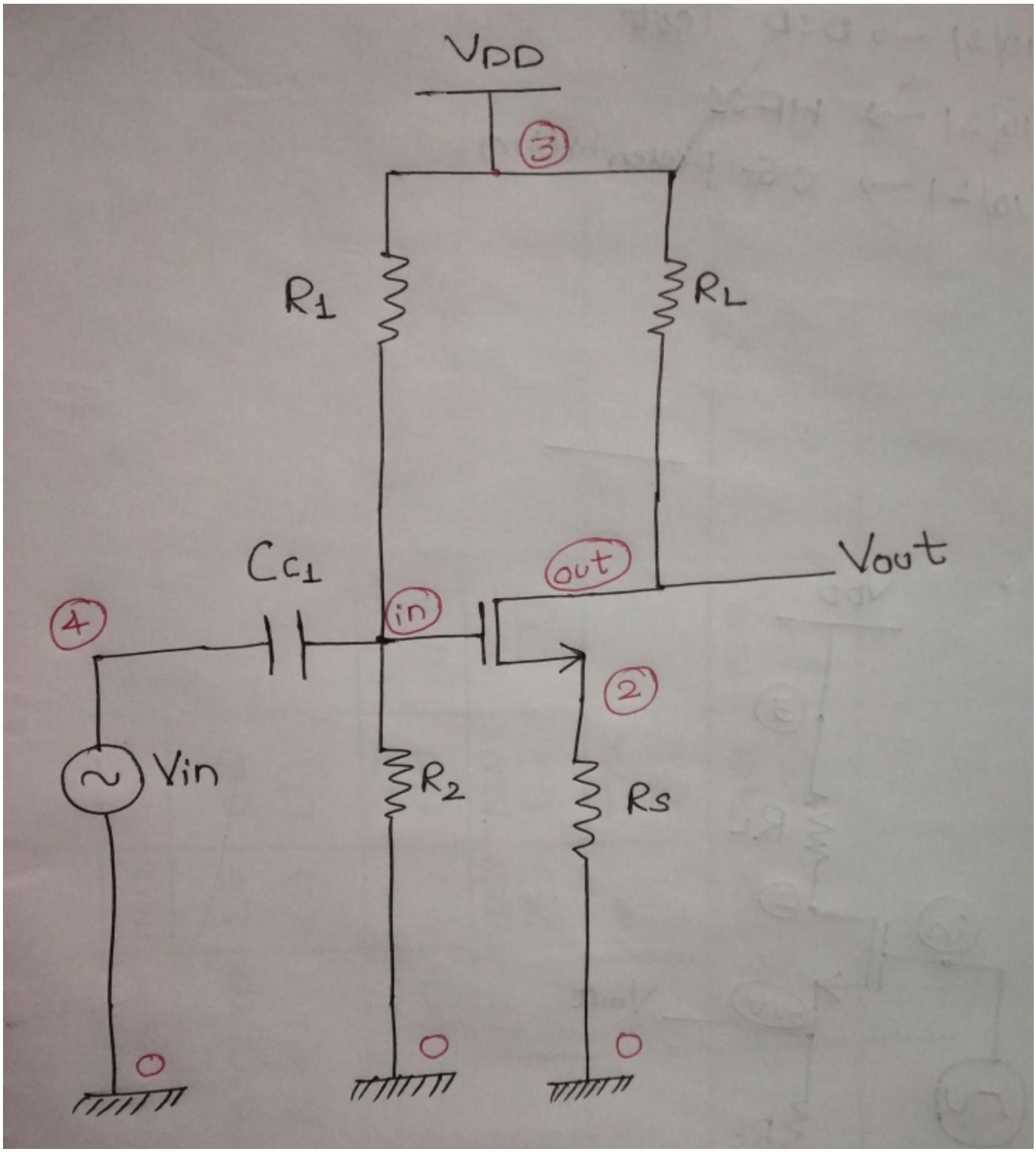


Fig.2: Schematic of Amplifier

Mentioning nodes for Fig.2

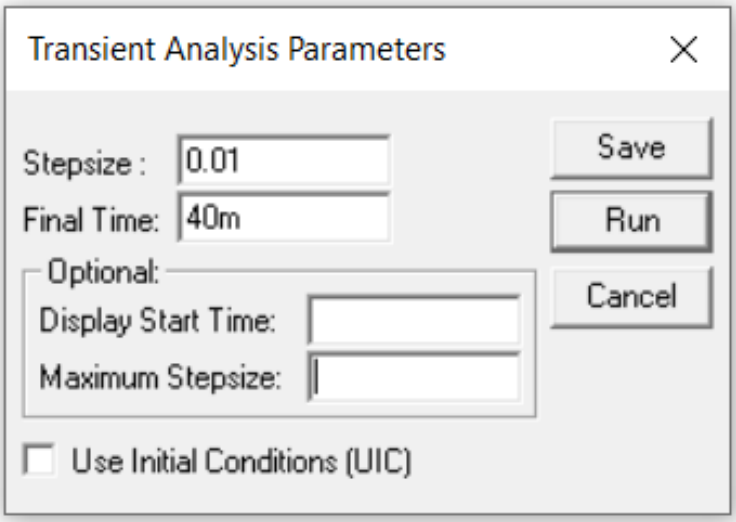


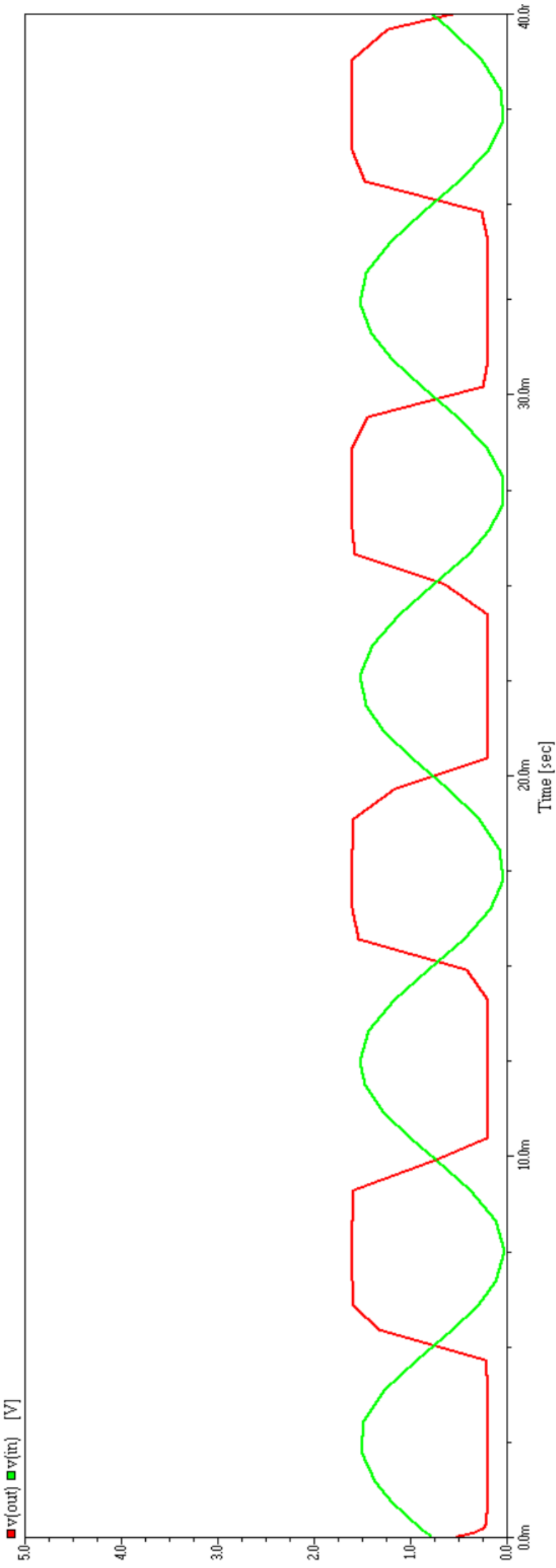
Solution 2

> WRITING THE NETLIST

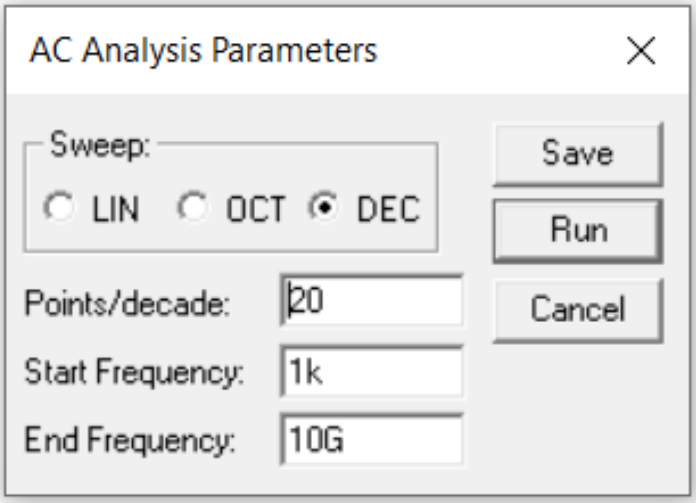
```
************ Question 2 ***************

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 110k
R2 in 0 140k
RL out 3 4k
Rs 2 0 3.5k

M1 out in 2 0 ntype l=180nm w=480nm

Cc1 in 4 0.5
Cc2 out 0 5p

.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
+RDSW    = 105.472458         PRWG     = 0.5
```

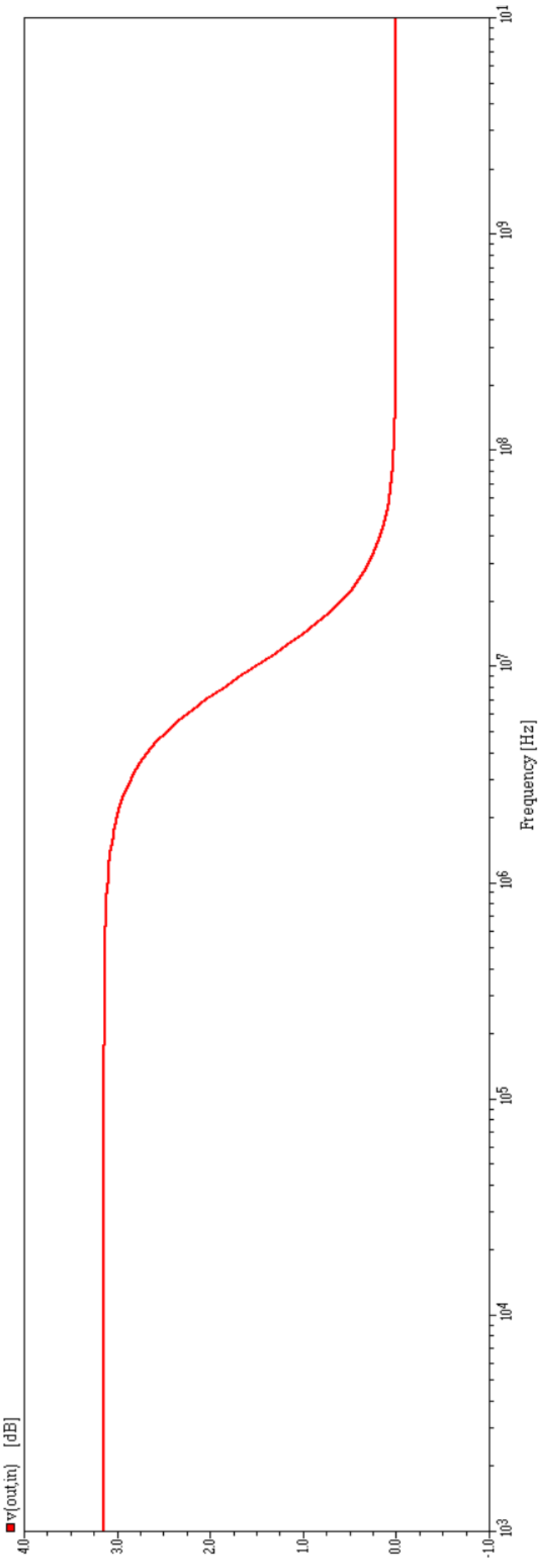
> TRANSIENT ANALYSIS





> 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).

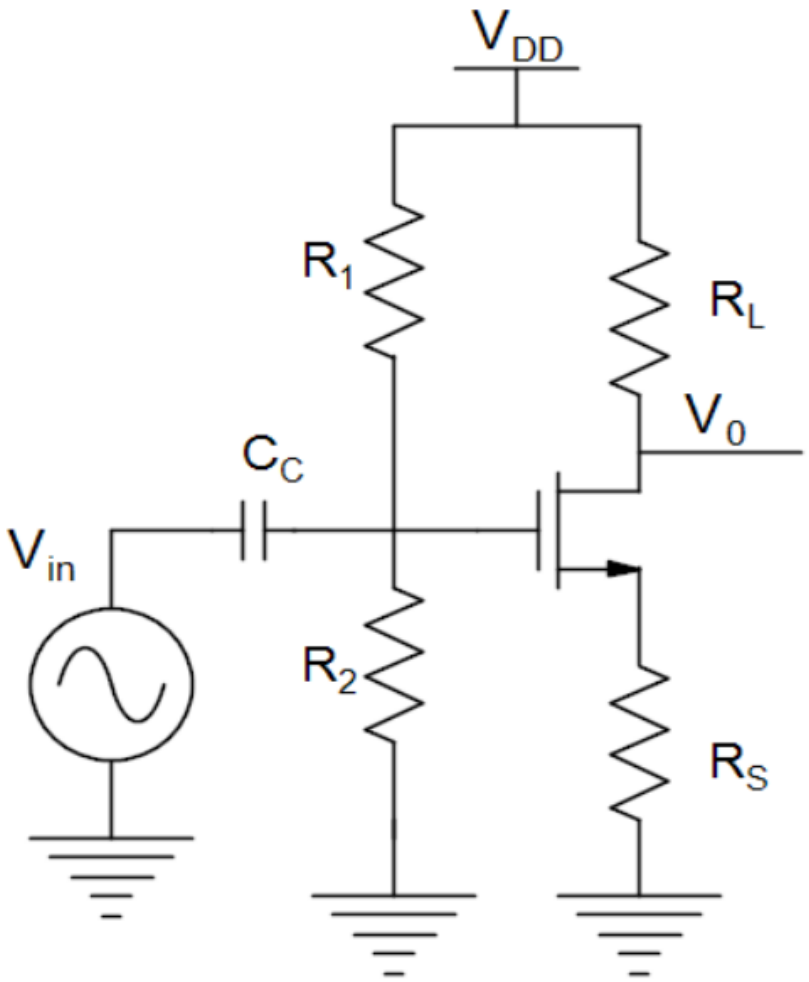
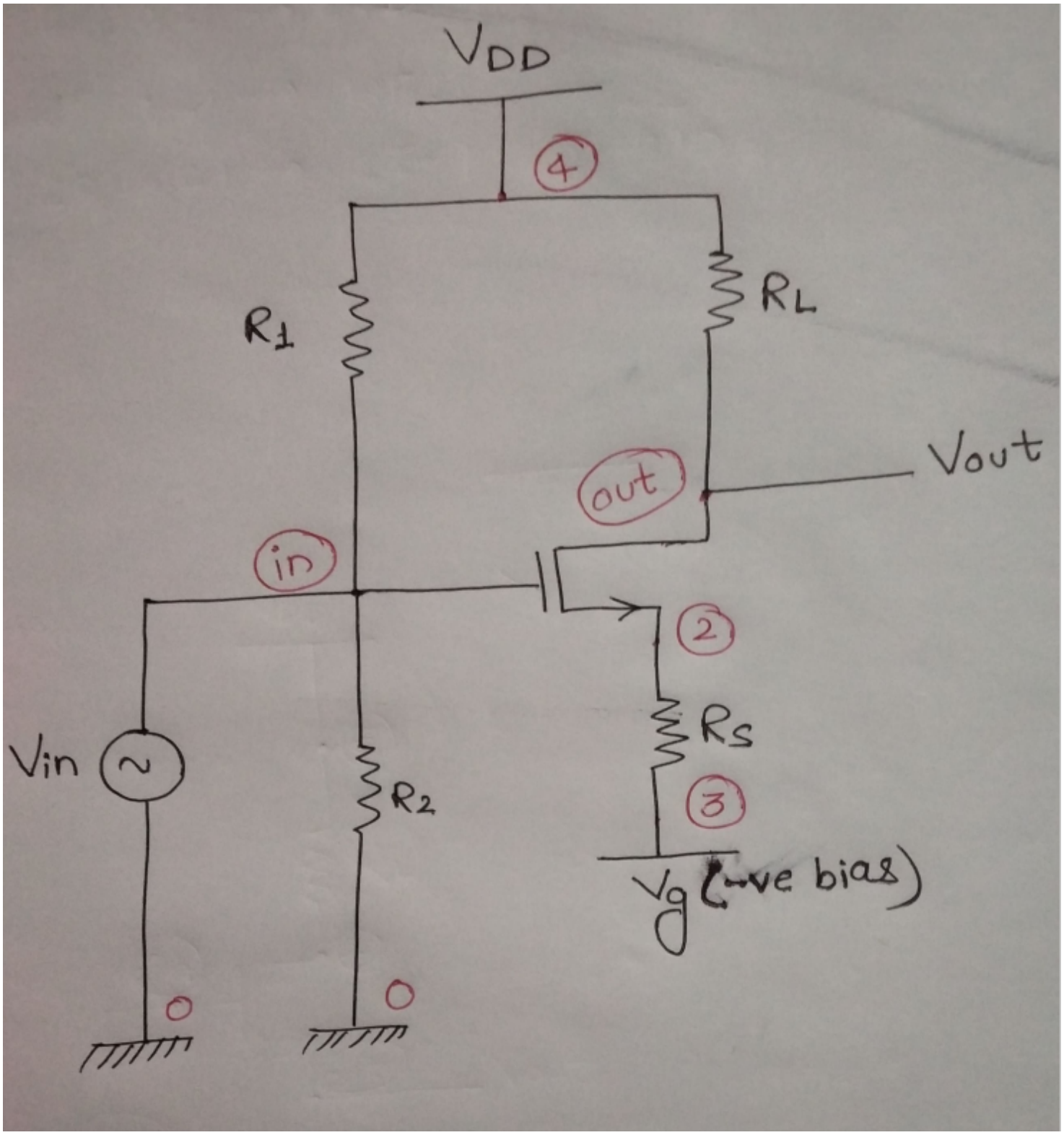


Fig.3: Schematic of Amplifier

Mentioning nodes for Fig.3

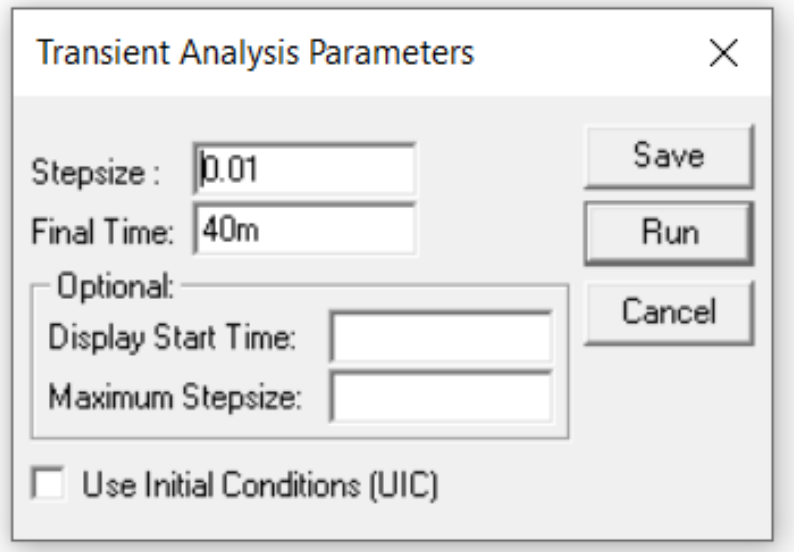


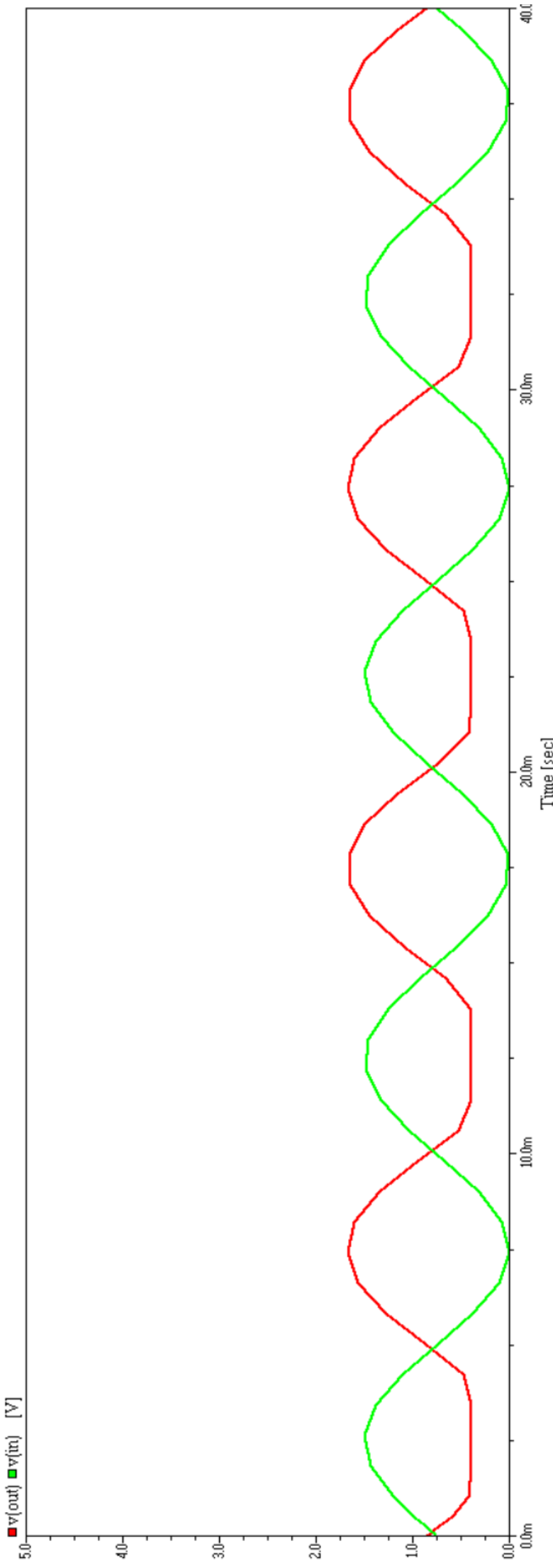
Solution 3

> WRITING THE NETLIST

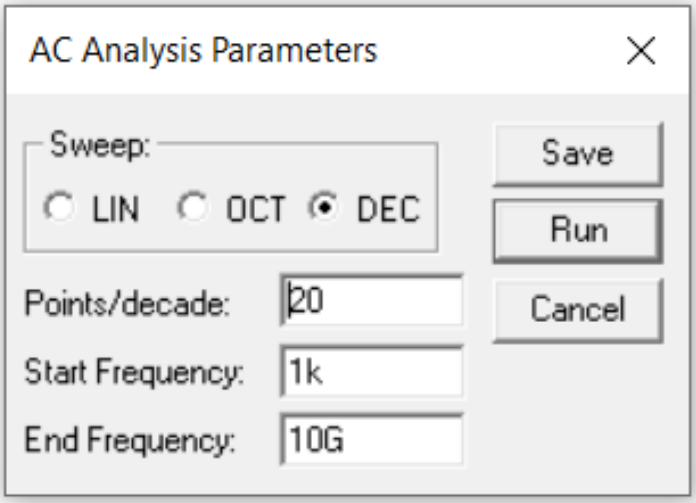
```
********** Question 3 ***********

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 30k
Rs 2 3 1.2k

M1 out in 2 0 ntype l=180nm w=480nm

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
+DVT0    = 1.3156832          DVT1     = 0.397759
+U0      = 280.5758609        UA       = -1.208176E-9
```

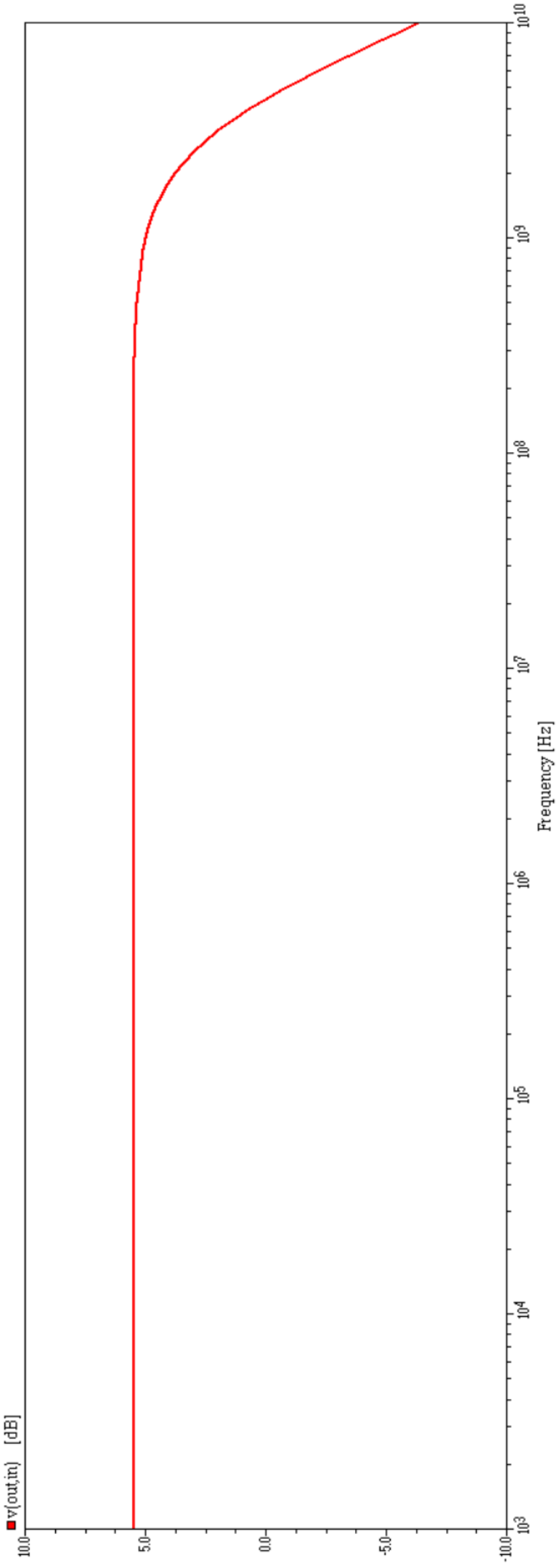
> TRANSIENT ANALYSIS





> AC output voltage gain analysis





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Thank you

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