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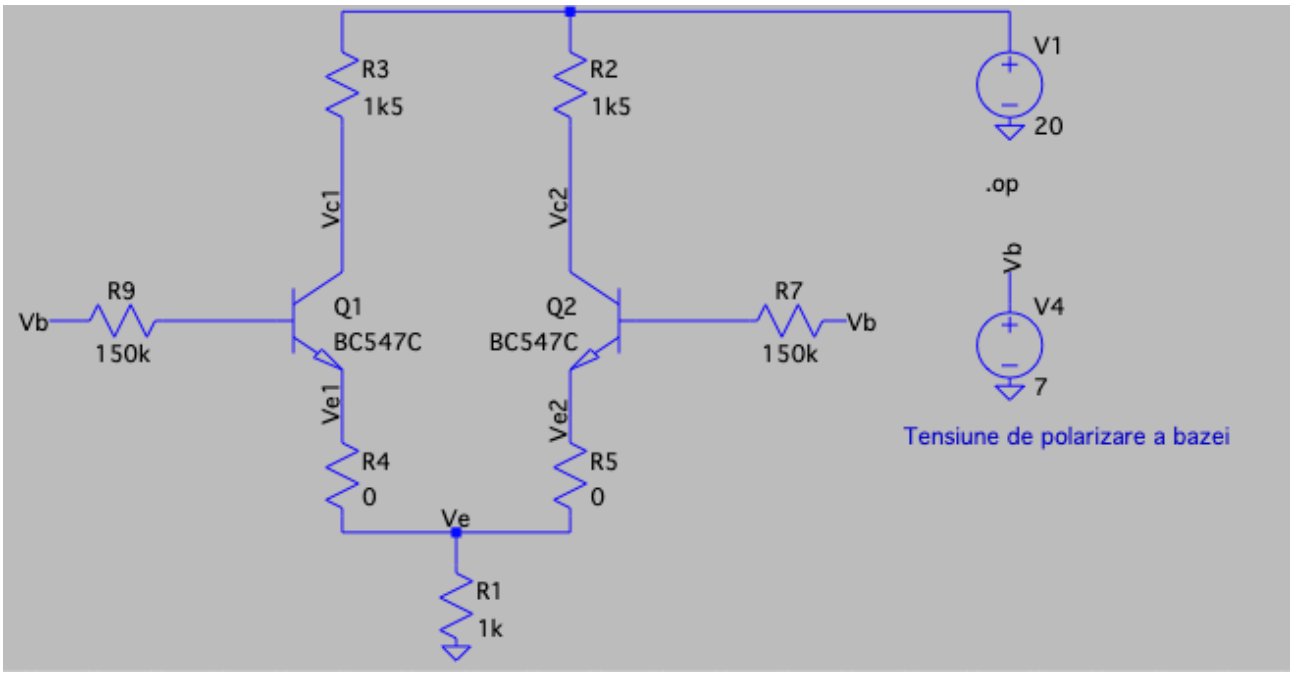
323CAa

Activitate practică Laborator 4

3.1 Importanta circuitului de polarizare

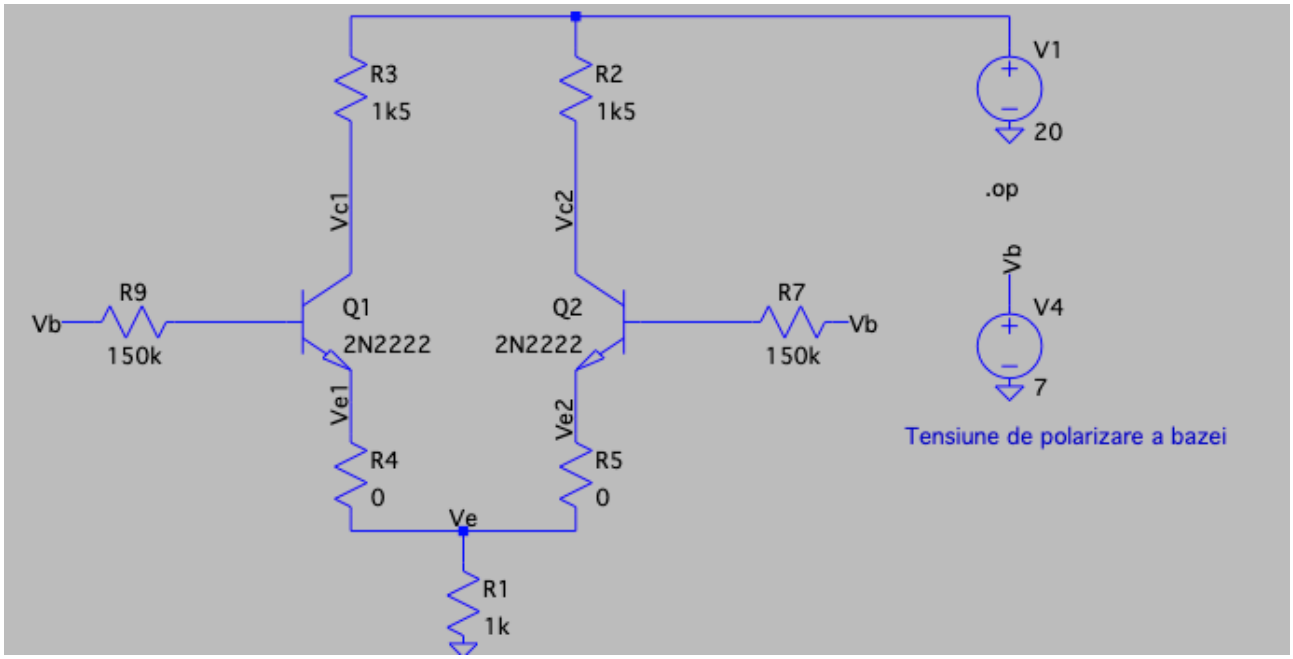
1.




```
Operating Bias Point Solution:
V(vc1)              15.8308   voltage
V(n002)             6.21433   voltage
V(ve)              5.56943   voltage
V(vc2)              15.8308   voltage
V(n003)             6.21433   voltage
V(n001)                  20   voltage
V(vb)                     7   voltage
Ic(Q2)          0.00277948   device_current
Ib(Q2)          5.23781e-06   device_current
Ie(Q2)          -0.00278472   device_current
Ic(Q1)           0.00277948   device_current
Ib(Q1)          5.23781e-06   device_current
Ie(Q1)          -0.00278472   device_current
I(R1)           0.00556943   device_current
I(R9)          -5.23781e-06   device_current
I(R7)           5.23781e-06   device_current
I(R3)           0.00277948   device_current
I(R2)           0.00277948   device_current
I(V4)          -1.04756e-05   device_current
I(V1)           -0.00555896   device_current
```

Uce = Vc1 - Vve => Uce = 15.8308 – 5.56943
Uce = 10.26137 V
Ic = 0.00277948 A => Ic = 2.77948 mA

2.

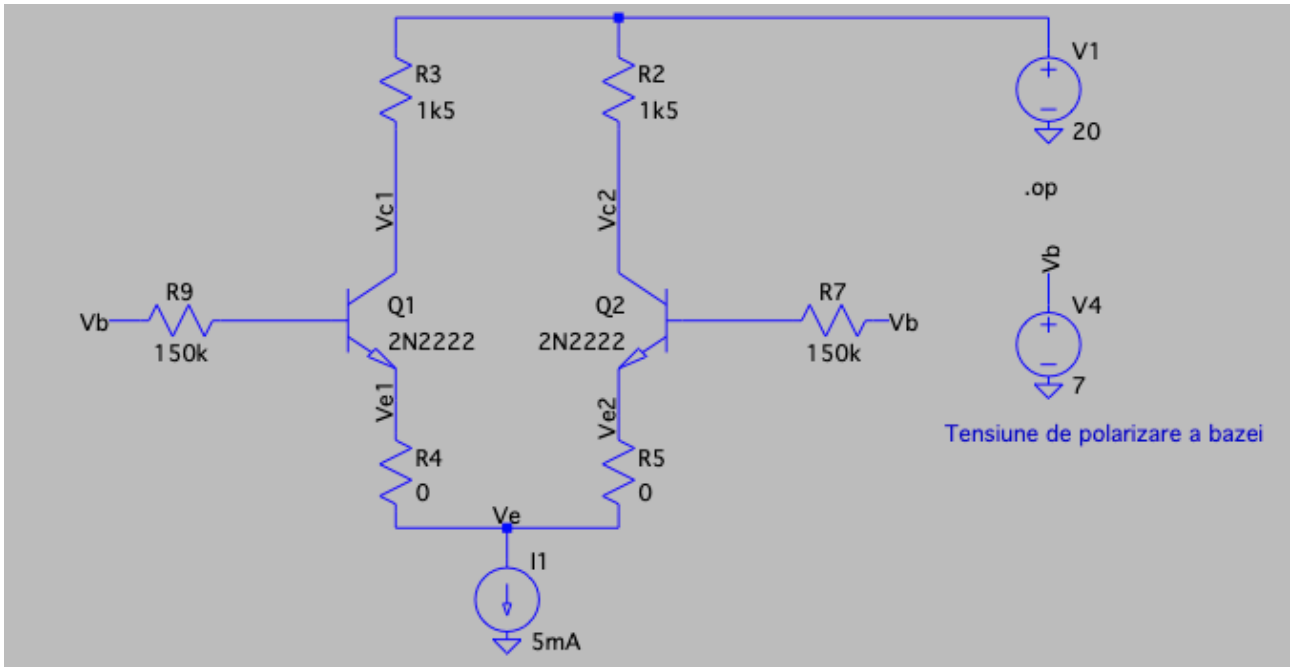



```
Operating Bias Point Solution:
V(vc1)              16.472   voltage
V(n002)             5.40061   voltage
V(ve)              4.72533   voltage
V(vc2)              16.472   voltage
V(n003)             5.40061   voltage
V(n001)                  20   voltage
V(vb)                     7   voltage
Ic(Q2)             0.002352   device_current
Ib(Q2)           1.06626e-05   device_current
Ie(Q2)            -0.00236266   device_current
Ic(Q1)               0.002352   device_current
Ib(Q1)           1.06626e-05   device_current
Ie(Q1)            -0.00236266   device_current
I(R1)              0.00472533   device_current
I(R9)            -1.06626e-05   device_current
I(R7)             1.06626e-05   device_current
I(R3)                0.002352   device_current
I(R2)                0.002352   device_current
I(V4)            -2.13251e-05   device_current
I(V1)               -0.004704   device_current
```

Uce = Vc1 - Vve => Uce = 16.472 – 4.72533
Uce = 11.74667 V
Ic = 0.002352 A => Ic = 2.352 mA

In cele doua cazuri de mai sus obtinem valori diferite ale punctelor statice de functionare ale tranzistoarelor. => Este prezenta o dependenta **clara** intre punctele statice de functionare calculate si masurate anterior si modelul tranzistoarelor utilizate.

3.



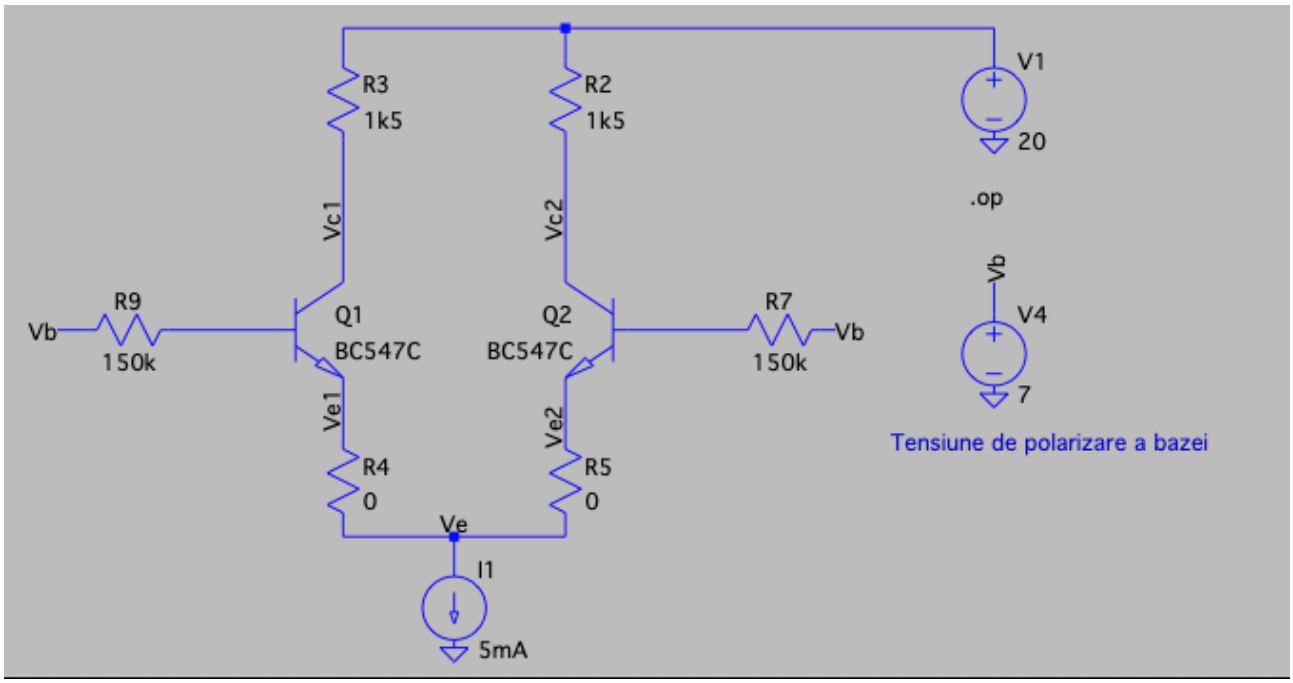

```
Operating Bias Point Solution:
V(vc1)             16.2669   voltage
V(n002)            5.30528   voltage
V(ve)              4.62846   voltage
V(vc2)             16.2669   voltage
V(n003)            5.30528   voltage
V(n001)                 20   voltage
V(vb)                    7   voltage
Ic(Q2)           0.0024887   device_current
Ib(Q2)          1.12981e-05  device_current
Ie(Q2)              -0.0025   device_current
Ic(Q1)           0.0024887   device_current
Ib(Q1)          1.12981e-05  device_current
Ie(Q1)              -0.0025   device_current
I(I1)                0.005   device_current
I(R9)          -1.12981e-05  device_current
I(R7)           1.12981e-05  device_current
I(R3)             0.0024887  device_current
I(R2)             0.0024887  device_current
I(V4)          -2.25963e-05  device_current
I(V1)            -0.0049774  device_current
```

Uce = Vc1 - Vve => Uce = 16.2669 – 4.62846

Uce = 11.63844 V

Ic = 0.0024887 A => Ic = 2.4887 mA

4.



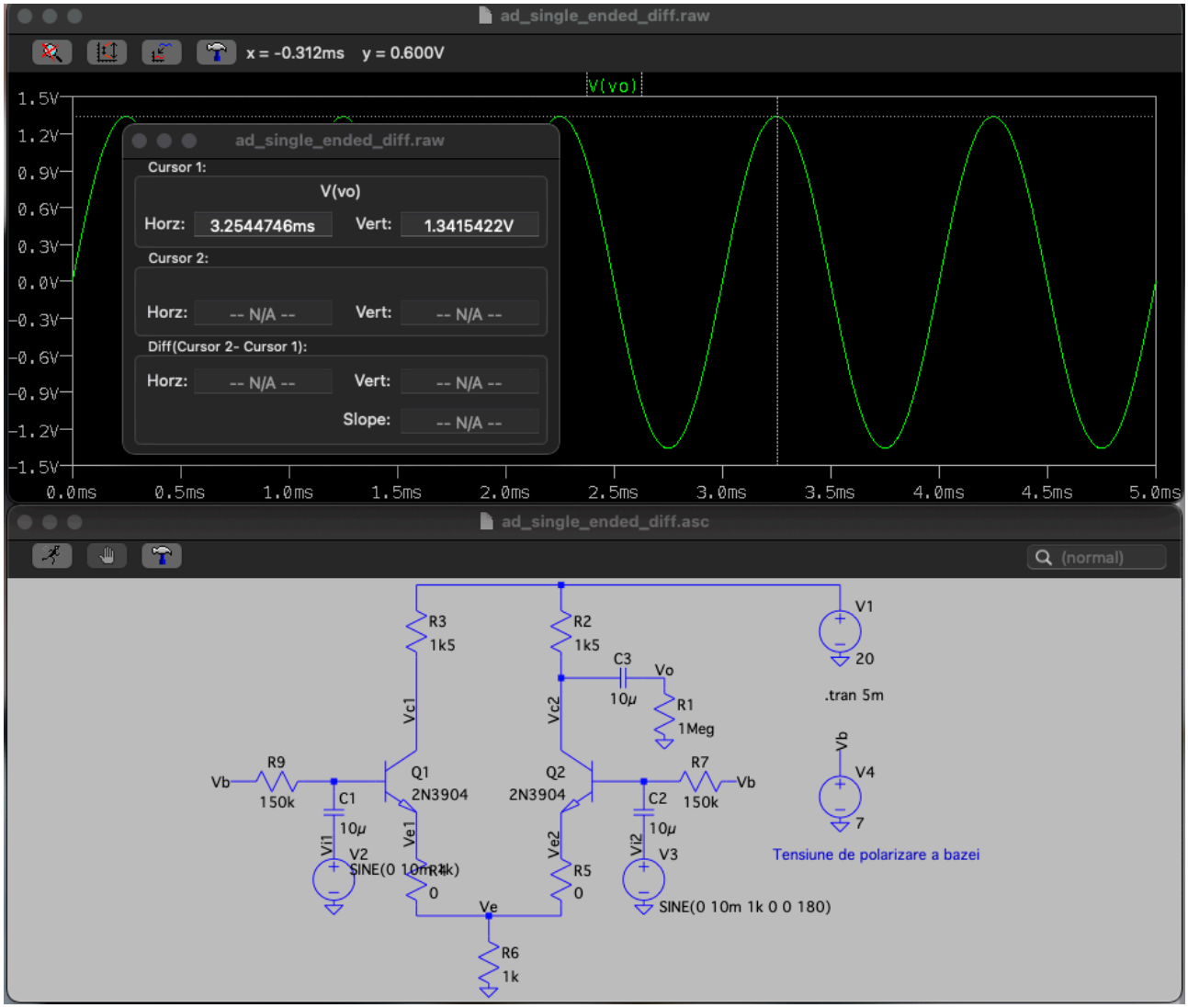

```
Operating Bias Point Solution:
V(vc1)              16.257   voltage
V(n002)             6.29967   voltage
V(ve)              5.65786   voltage
V(vc2)              16.257   voltage
V(n003)             6.29967   voltage
V(n001)                  20   voltage
V(vb)                     7   voltage
Ic(Q2)           0.00249533   device_current
Ib(Q2)           4.66888e-06   device_current
Ie(Q2)              -0.0025   device_current
Ic(Q1)           0.00249533   device_current
Ib(Q1)           4.66888e-06   device_current
Ie(Q1)              -0.0025   device_current
I(I1)                 0.005   device_current
I(R9)           -4.66888e-06   device_current
I(R7)            4.66888e-06   device_current
I(R3)            0.00249533   device_current
I(R2)            0.00249533   device_current
I(V4)           -9.33776e-06   device_current
I(V1)            -0.00499066   device_current
```

Uce = Vc1 - Vve => Uce = 16.257 – 5.65786
Uce = 10.59914 V
Ic = 0.00249533 A => Ic = 2.49533 mA

Valorile punctelor statice de functionare ale tranzistoarelor difera fata de cazurile de mai sus. Intensitatea este apropae neschimbata. Imbunatatirea adusa de utilizarea sursei de curent in locul rezistentei de cuplaj este faptul ca se forteaza o scurgere de 5mA catre sursa.

3.2 Determinarea amplificarii diferentiale

1.



V0 = 1.341 V

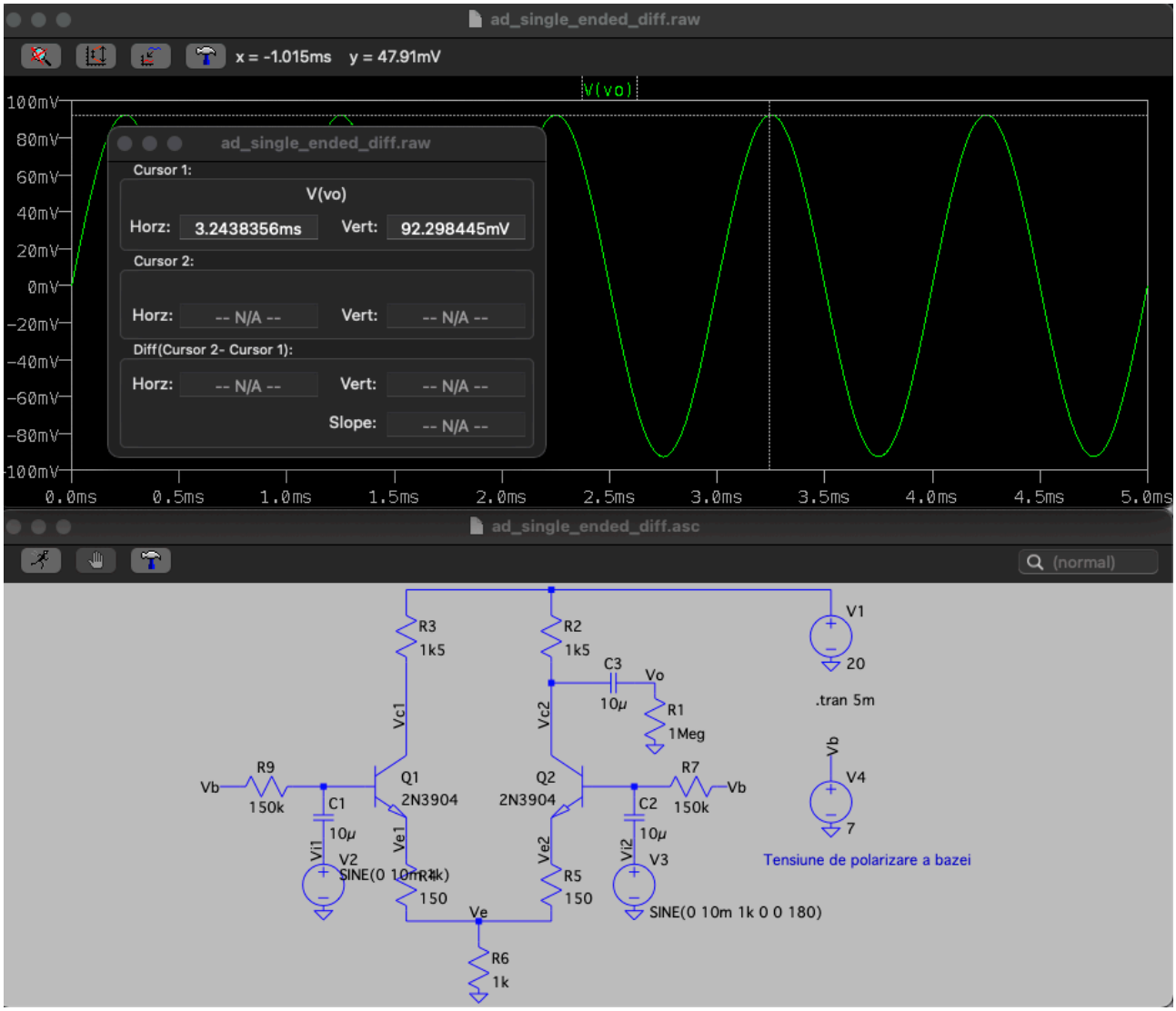
Ad = V0 / (V2 - V3)

V2 = 10 mV

V3 = -10 mV (defazaj 180 grade)

=> Ad = 1.341 / (10 - (-10)) = 67.05

2.

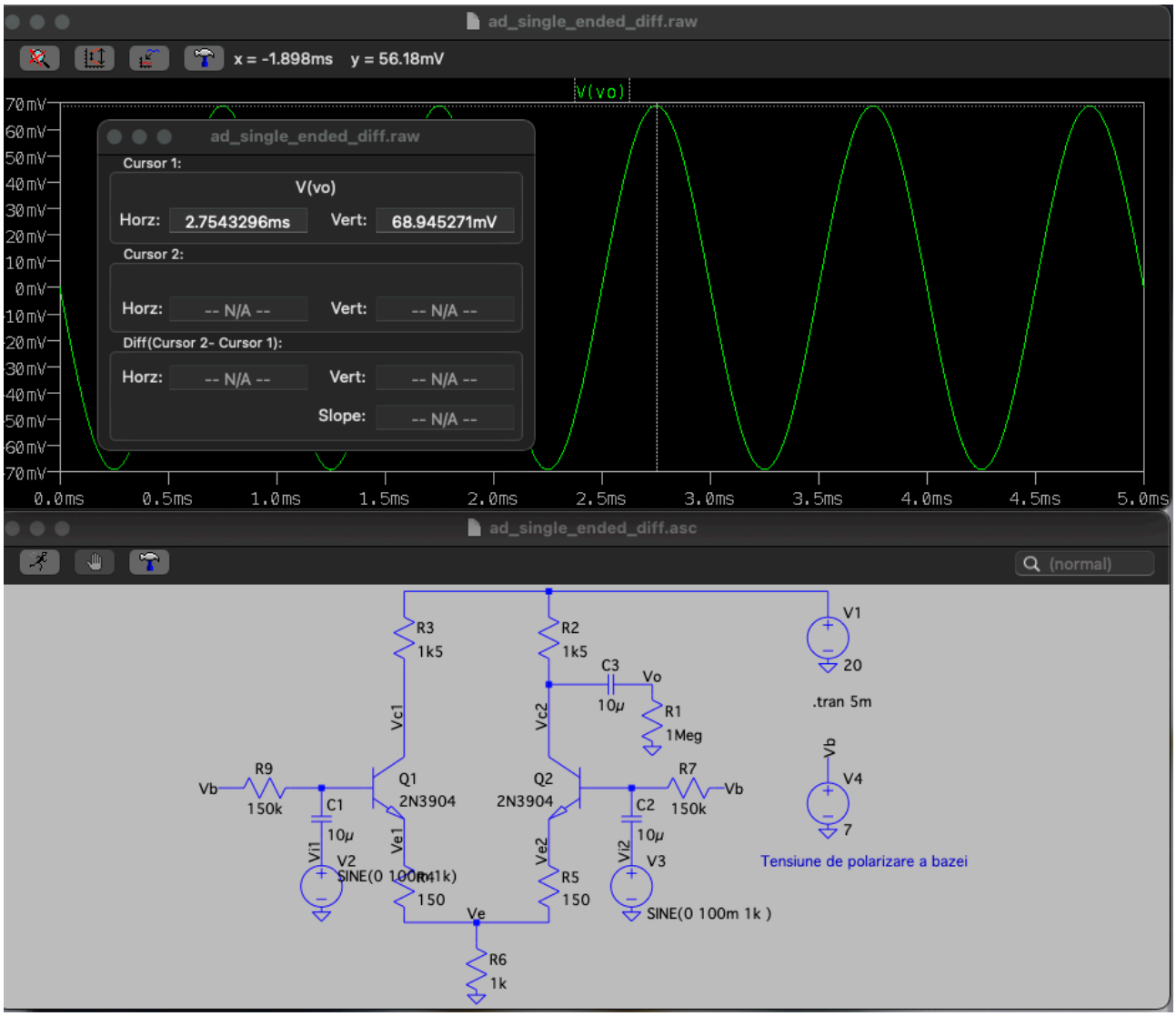


V0 = 92.298 mV
Ad = V0 / (V2 - V3)
V2 = 10 mV
V3 = -10 mV (defazaj 180 grade)
=> Ad =92.298 / (10 - (-10)) = 4.6149

In acest caz amplificarea diferentiala este mai mica deoarece V0 este mai mica.

3.3 Determinarea amplificarii de mod comun. Influenta rezistentei de cuplaj a emitoarelor asupra factorului de rejectie a modului comun.

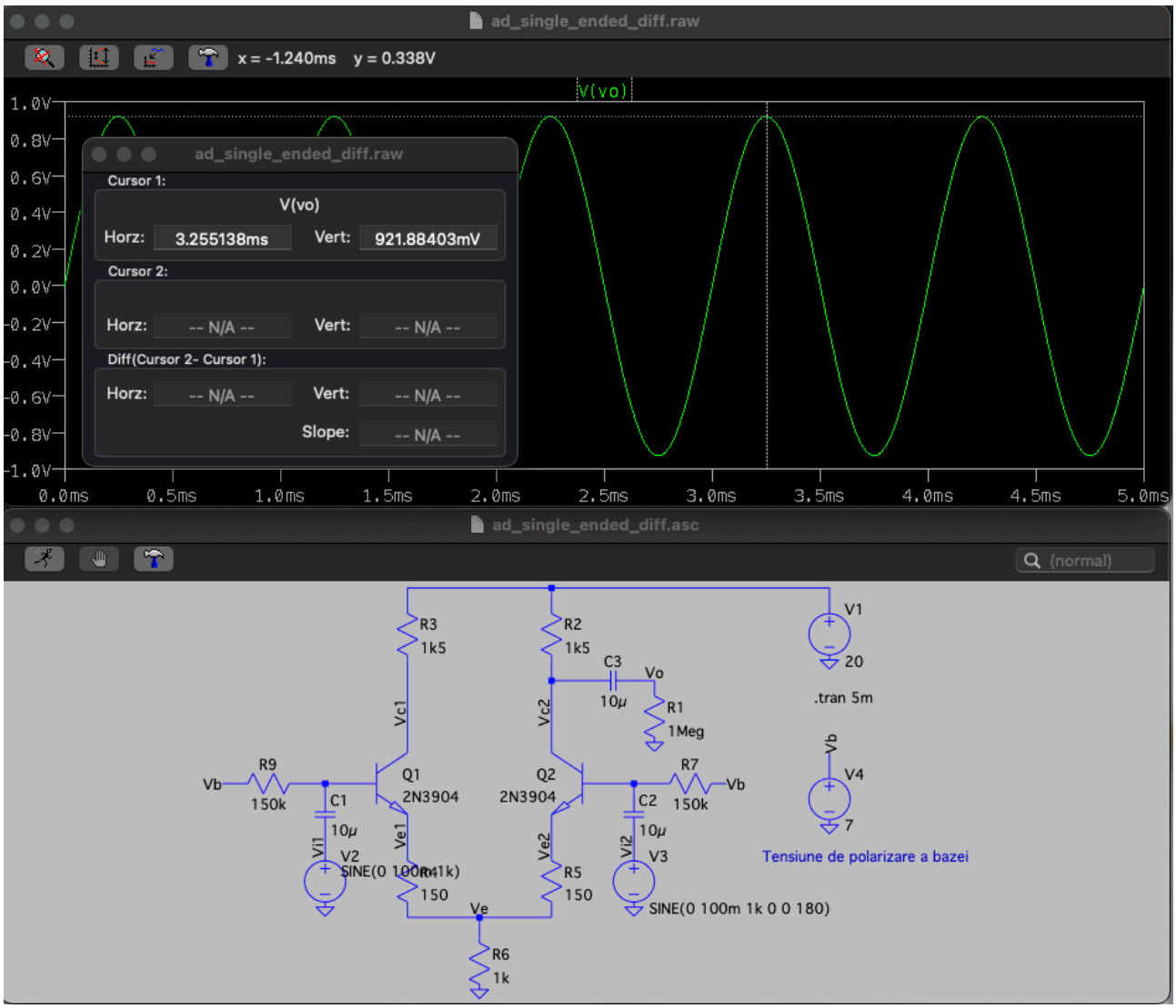
1.



V0 = 68.945 mV

V0 = Ad (Vi1 - Vi2) + Ac ((Vi1 + Vi2) / 2) => V0 = Ac Vi1 => Ac = V0 / V1

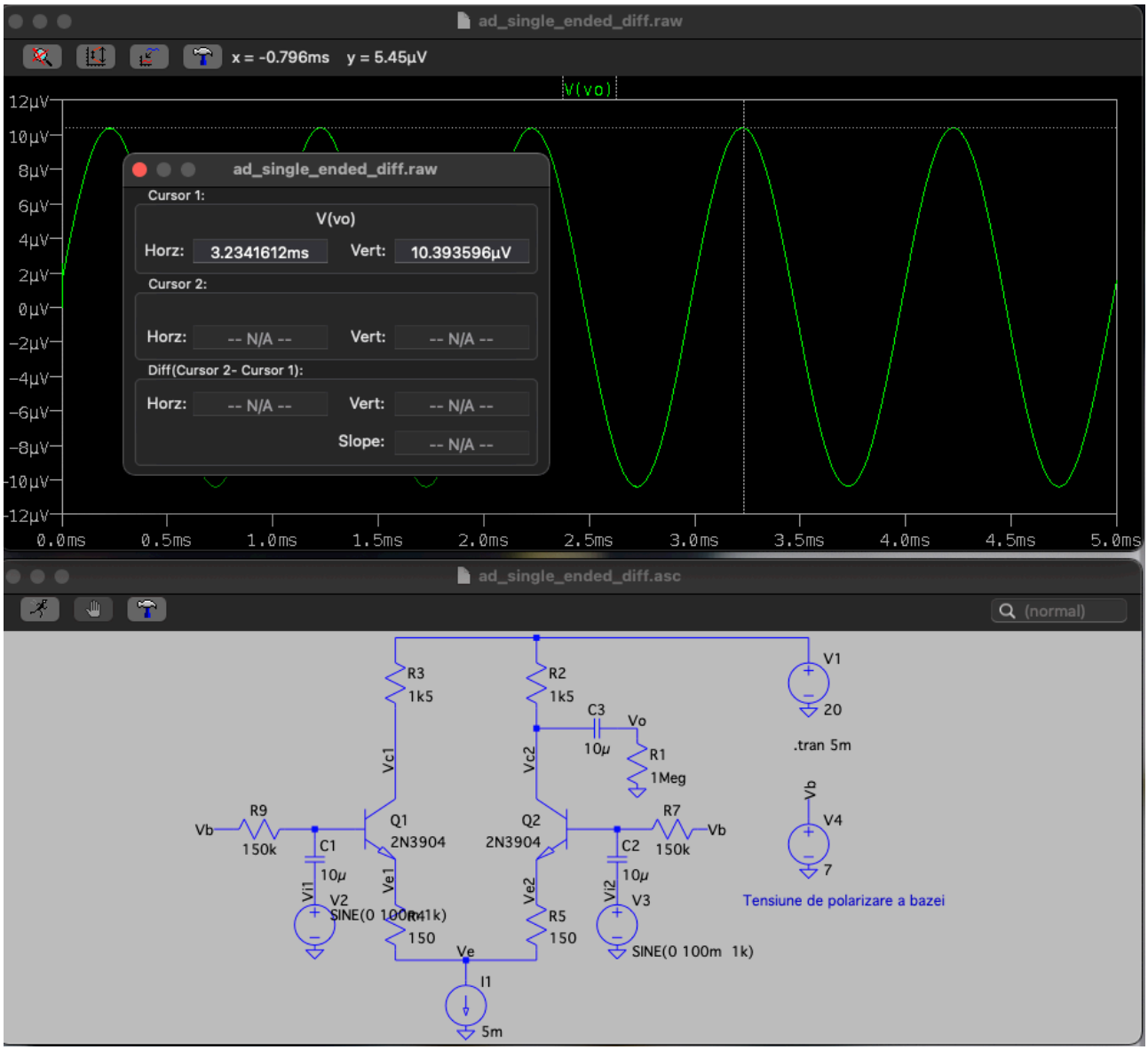
Ac = V0 / Vi1 => Ac = 68.945 / 100 = 0.68945 mV (amplificare in mod comun)



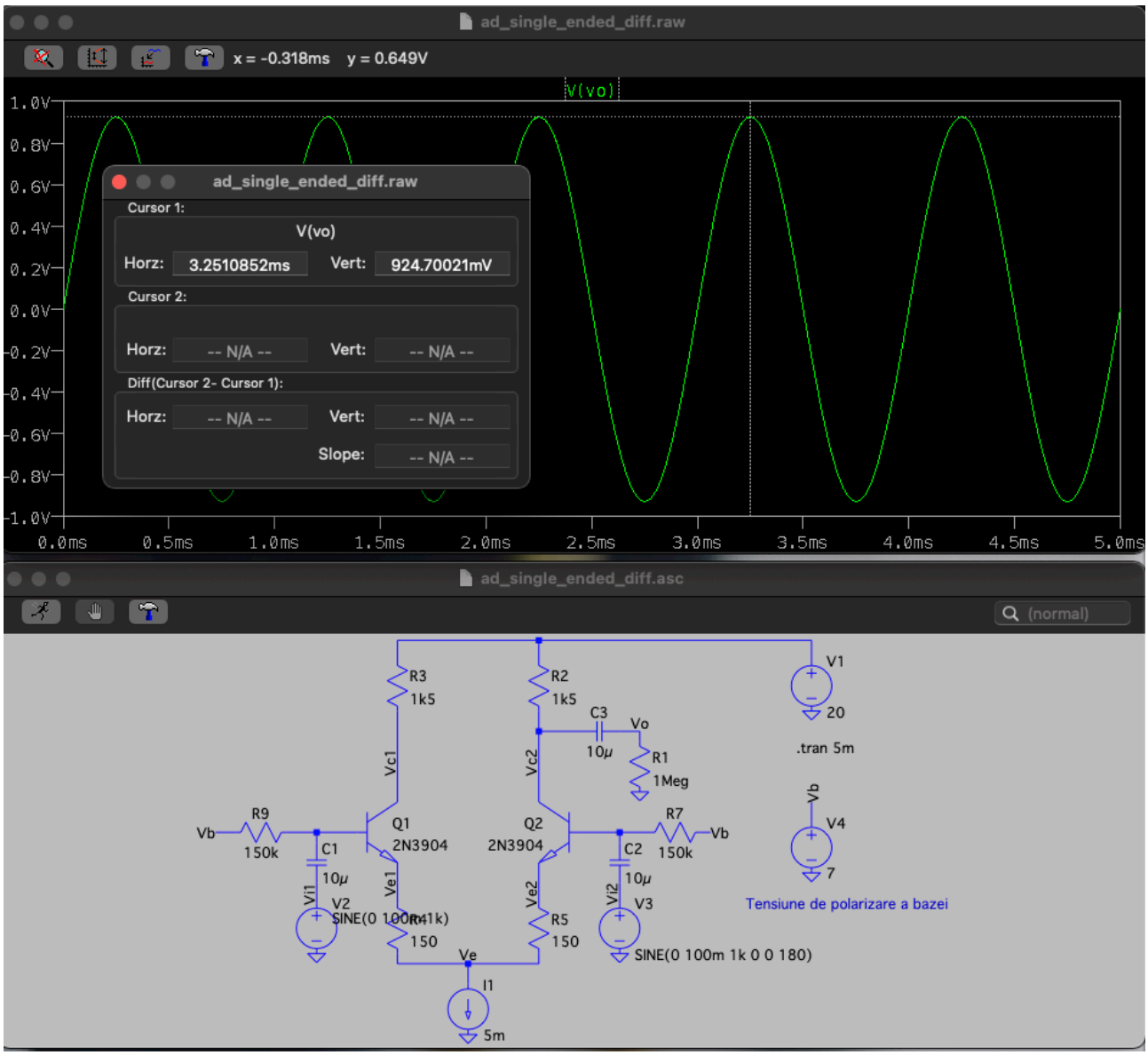
V0 = 921.884 mV
Ad = V0 / (Vi1 - V12) => Ad = 921.884 / (100 - (-100)) = 4.60942 mV

CMRR = 20 $\log_{10}$ (Ad / Ac) => CMRR = 20 log10(4.60942 / 0.68945)
CMRR = 16.5028701186 dB

2.



V0 = 10.393 µV
V0 = Ad (Vi1 - Vi2) + Ac ((Vi1 + Vi2) / 2) => V0 = Ac Vi1 => Ac = V0 / V1
Ac = V0 / Vi1 => Ac = 10.393 / 100 = 10.393 * 100000 mV
(amplificare in mod comun)



V0 = 924.700 mV
Ad = V0 / (Vi1 - V12) => Ad = 924.700 / (100 - (-100)) = 4.6235 mV

CMRR = 20 $\log_{10}$ (Ad / Ac) => CMRR = 20 log10(4.6235 / 10.393 * 100000)
CMRR = 92.9645986936 dB

Noua valoare a factorului de rejectie a modului comun este mai mare in cazul actual fata de cel de la 3.1, fapt din care rezulta ca avem o rejectie eficienta.

CMRR se mareste odata cu rezistenta de cuplaj a tranzistoarelor.