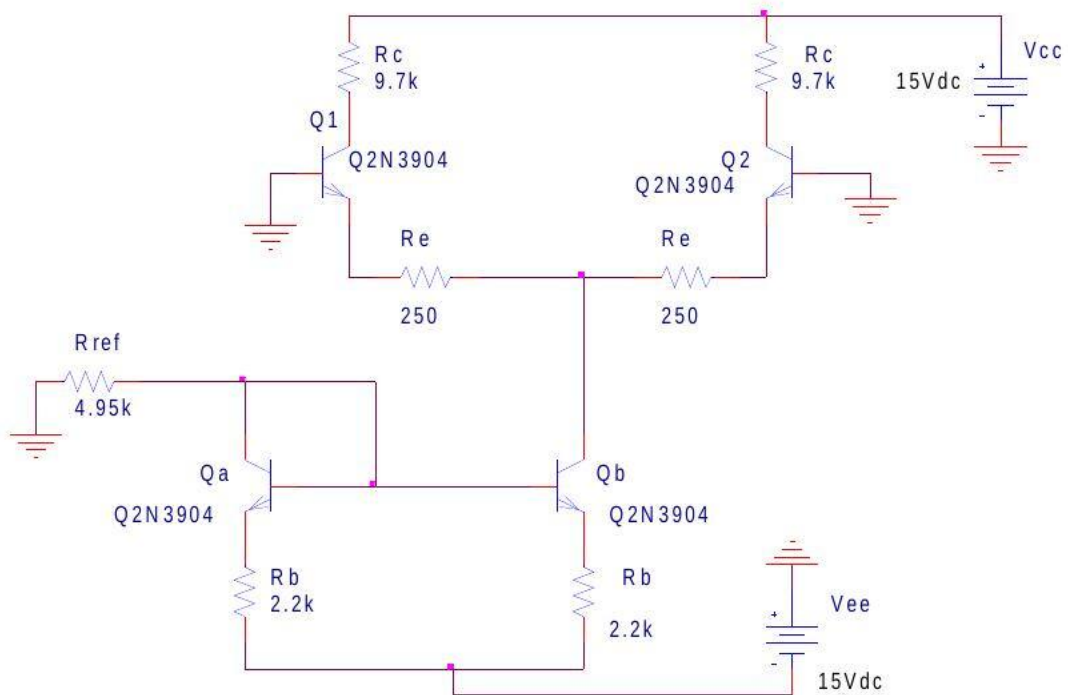
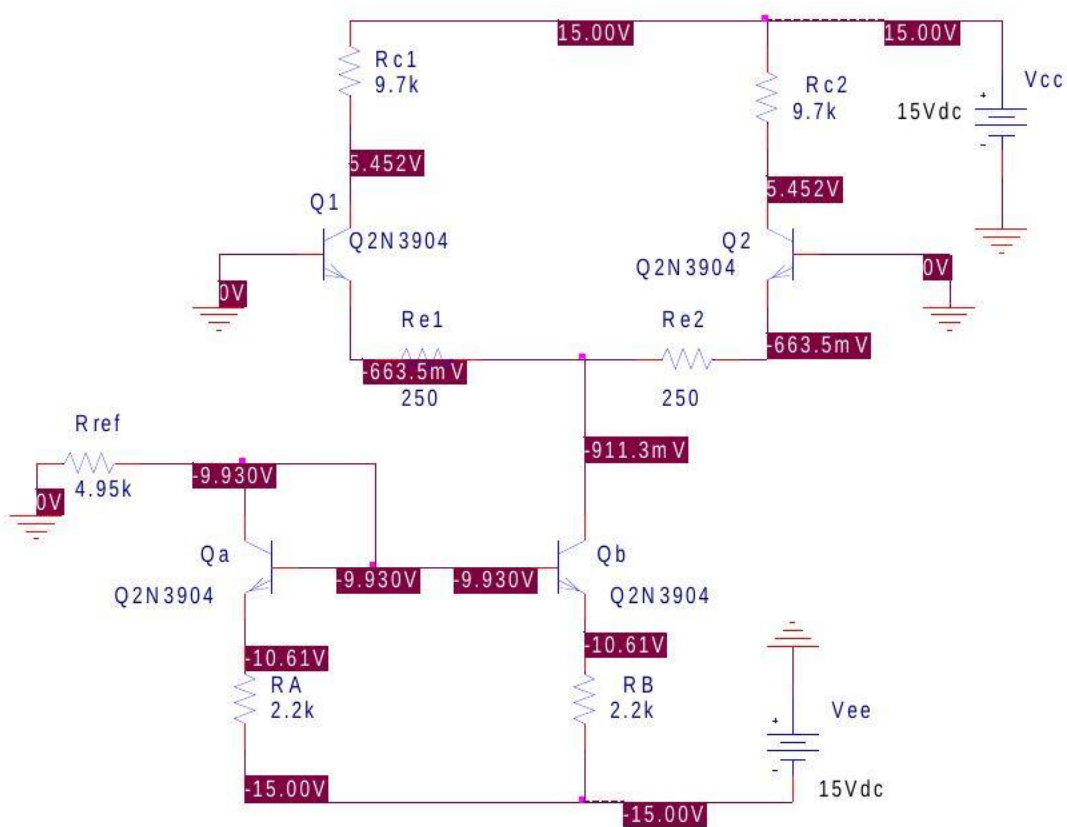


a)

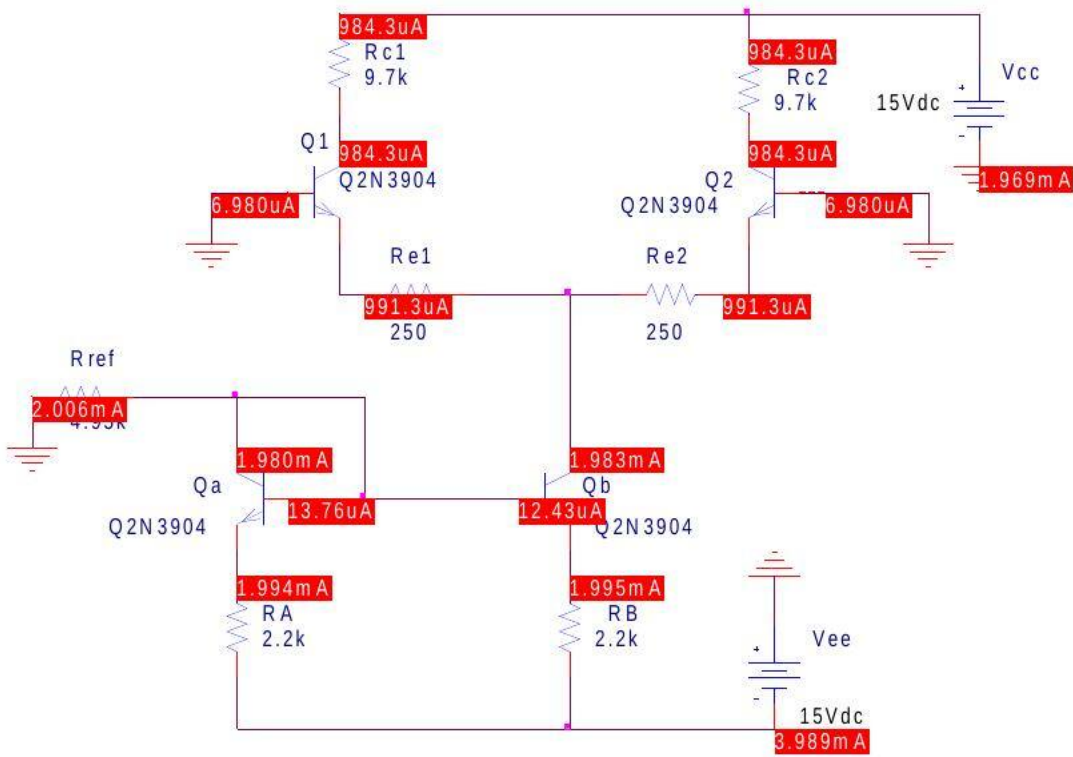


b) Bias Simulation

Voltajlar



Akımlar



Pspice' da ölçülen değerlere göre;

$$V_{CE1} = V_{C1} - V_{E1} = 6.11 \text{ V}$$

$$V_{CE2} = V_{C2} - V_{E2} = 6.11 \text{ V}$$

$$I_{CQ1} = 991.3 \text{ uA} \approx 1 \text{ mA}$$

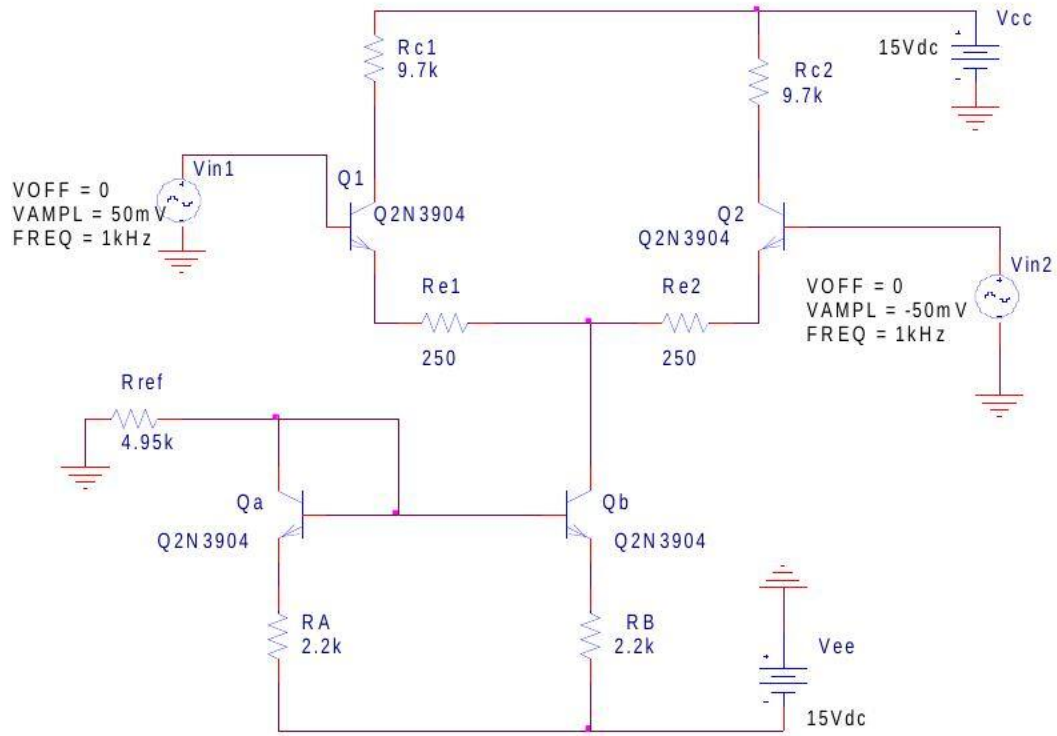
$$I_{CQ2} = 991.3 \text{ uA} \approx 1 \text{ mA}$$

$$I_{CQA} = 1.994 \text{ mA} \approx 2 \text{ mA}$$

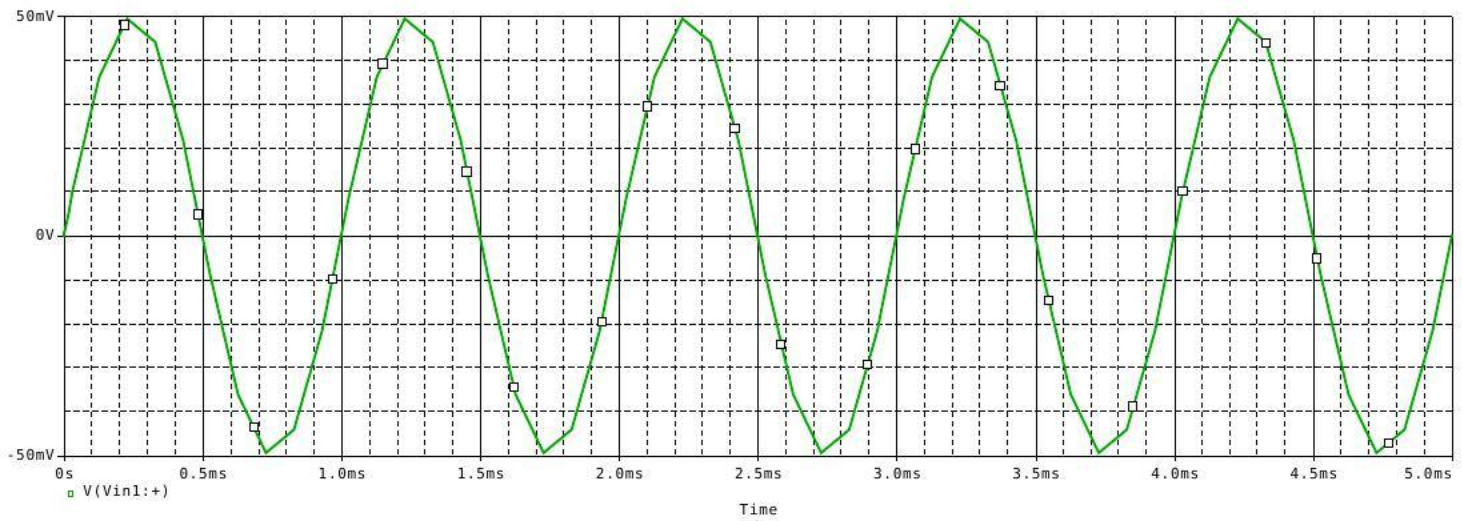
$$I_{CQB} = 1.995 \text{ mA} \approx 2 \text{ mA}$$

Değerler Ön çalışmanın 1. sorusunda hesapladığımız değerlere çok yakın çıktı. Yani yaptığımız design doğrudur.

c) Transient Simulation

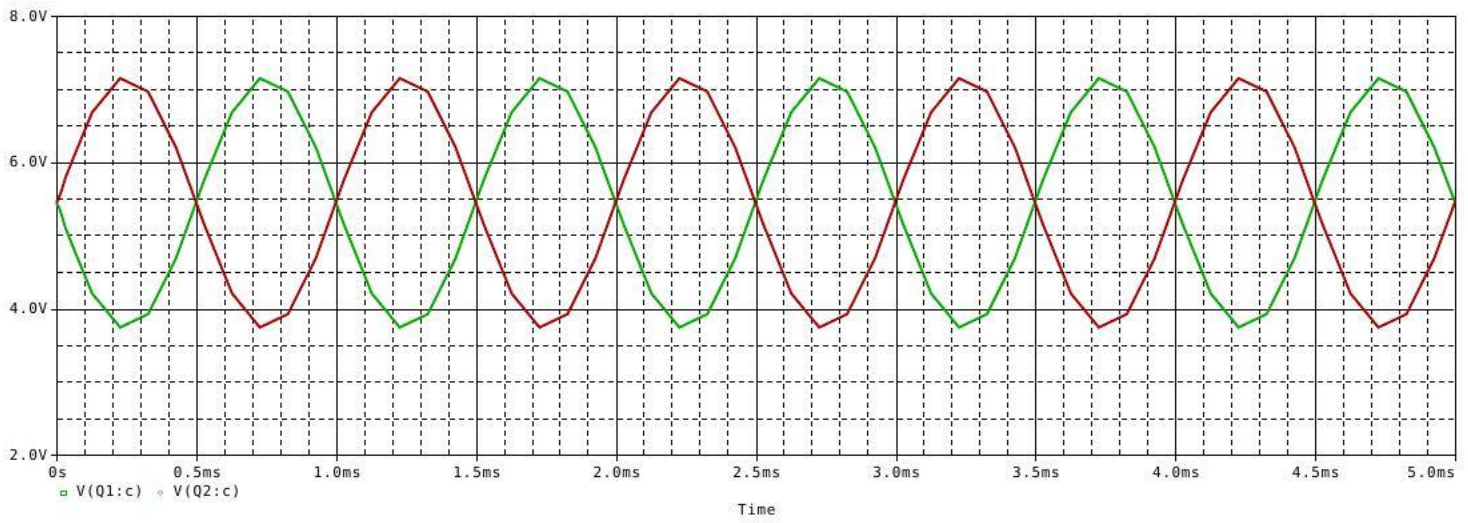


V_{in1} Grafiği :



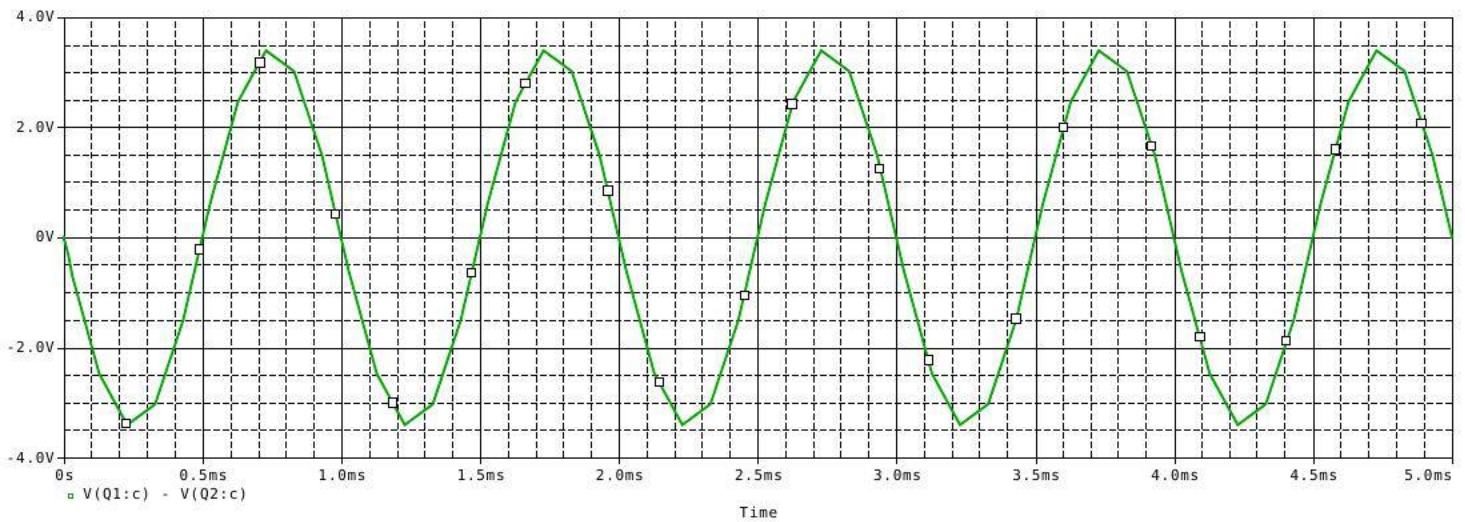
$$V_{p-p} = 99.046 \text{ V}$$

Vout1 ve Vout2 Grafiği :



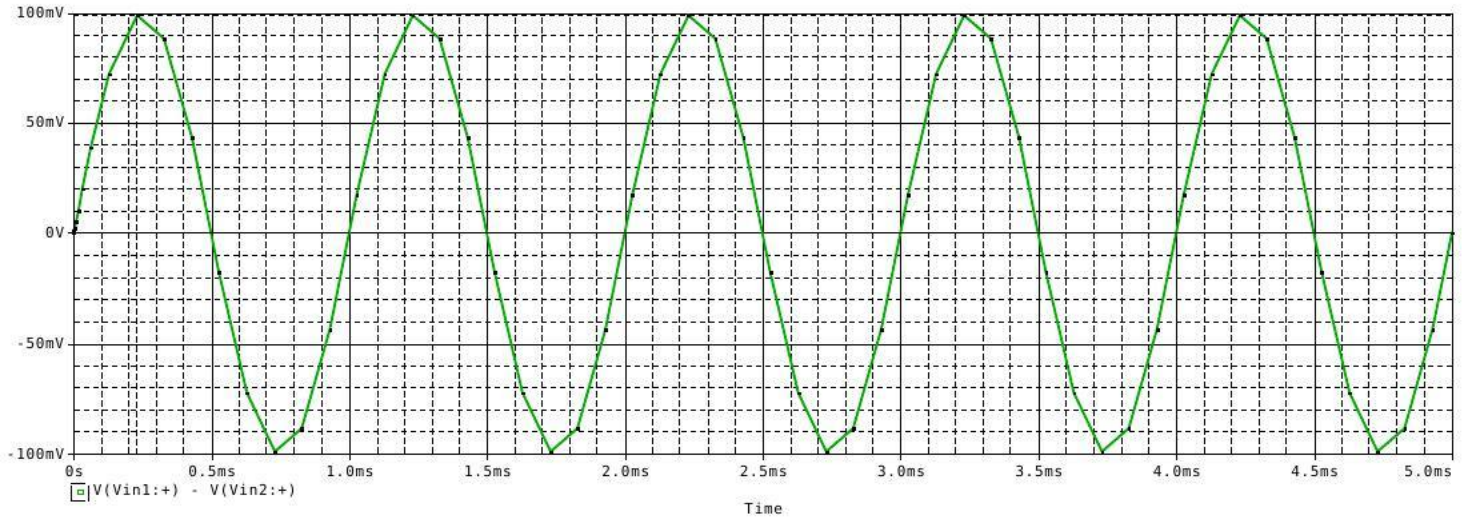
$V_{p-p} = 3.407 \text{ V}$

Vodm = Vout1 – Vout2 Grafiği :



$V_{p-p} = 6.813 \text{ V}$

V_{idm} = V_{in1} – V_{in2} Grafiği :



$$V_{p-p} = 198.092 \text{ mV}$$

$$A_{vdm-diff} = \frac{V_{out1} - V_{out2}}{V_{in1} - V_{in2}} \text{ Formülüne göre ;}$$

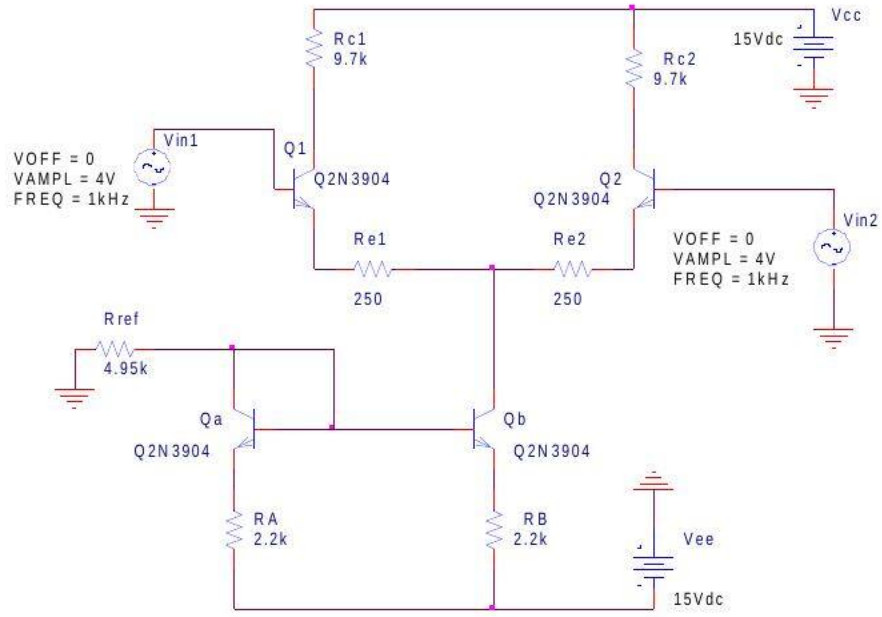
$$A_{vdm-diff} = -34.394$$

$$A_{vdm-se1} = \frac{V_{out1}}{V_{idm}} \text{ Formülüne göre ;}$$

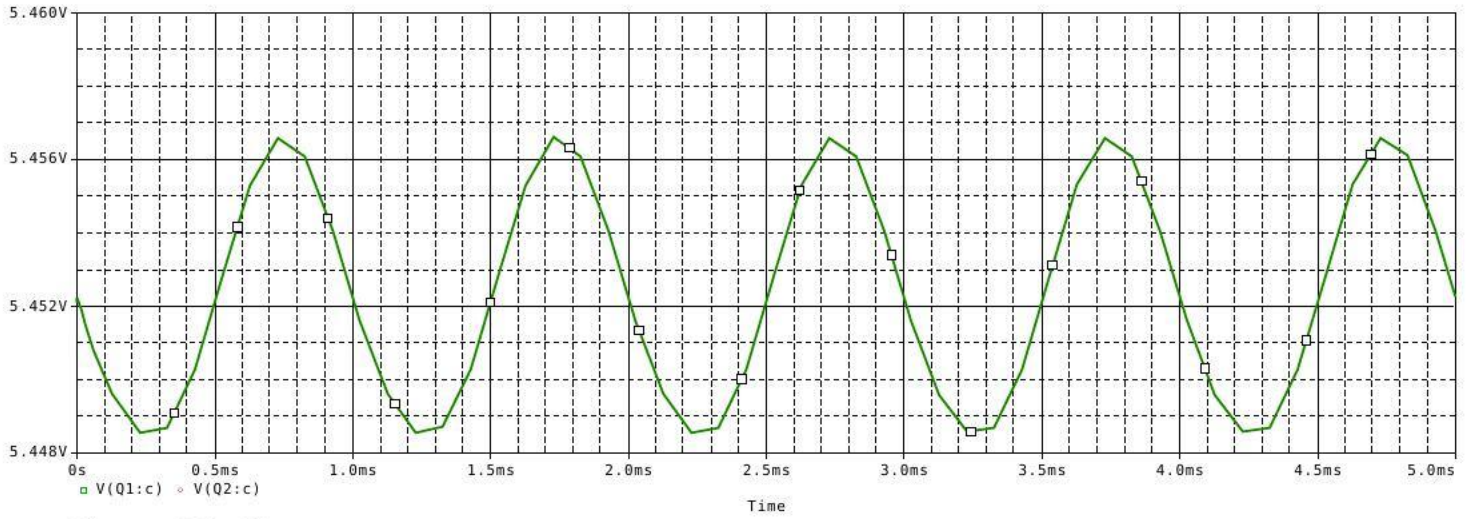
$$A_{vdm-se1} = -17.2$$

$$A_{vdm-se2} = \frac{V_{out2}}{V_{idm}} \text{ Formülüne göre ;}$$

$$A_{vdm-se2} = 17.2$$

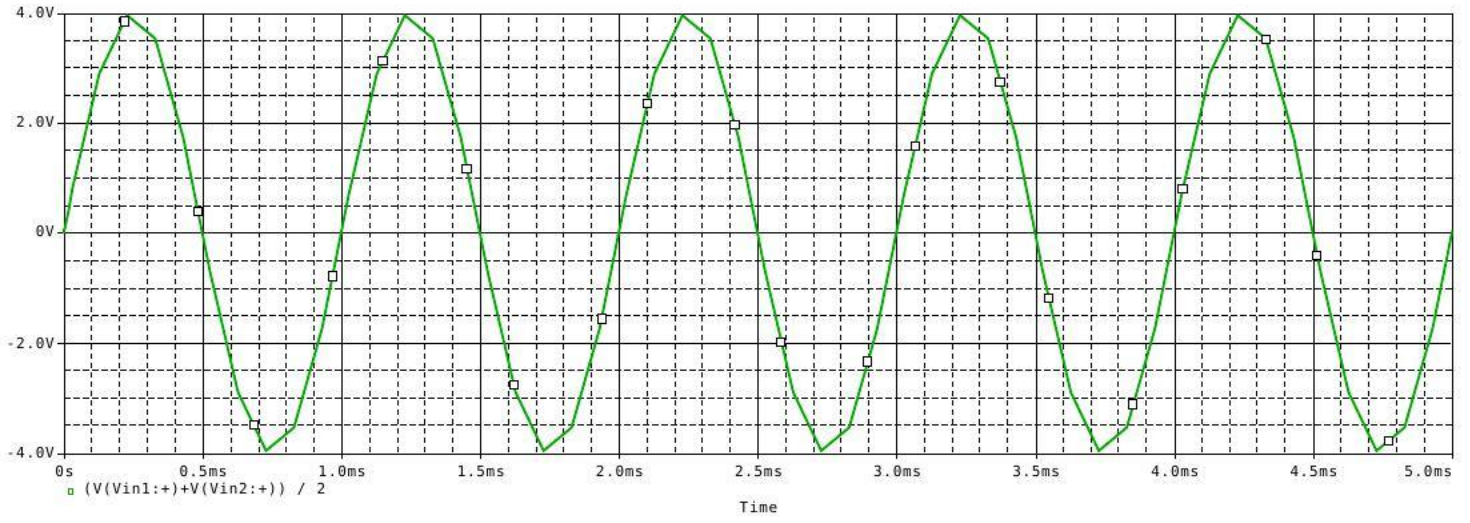


Vout1 ve Vout2 Grafiği :



Vp-p = 8.1 mV

$V_{icm} = (V_{in1} + V_{in2}) / 2$ Grafiđi :



$V_{p-p} = 7.9238 \text{ V}$

$$A_{v_{cm-se1}} = A_{v_{cm-se2}} = \frac{v_{out1}(v_{out2})}{v_{icm}} \quad \text{Formülüne göre ;}$$

$$A_{v_{cm-se1}} = A_{v_{cm-se2}} = 7.5153 \times 10^{-6}$$

d)

Ön Çalışmada bulunan değerler

R_C	9.7 k Ω
R_{ref}	4.95 k Ω
$A_{vdm-diff}$	-35.27
$A_{vdm-se1}$	-17.64
$A_{vdm-se2}$	17.64
R_{EE}	7.025k Ω
CMRR	25.6
$A_{vcm-se1}$	-0.68
R_{idm}	55 k Ω
R_{icm}	365 k Ω

$v_{in1} = 50mV_{p-p}$ ve $v_{in2} = -50mV_{p-p}$ için:

R_C	9.7 k Ω
R_{ref}	4.95 k Ω
$A_{vdm-diff}$	-34.394
$A_{vdm-se1}$	-17.2
$A_{vdm-se2}$	17.2
V_{out1}	-3.407 V _{p-p}
V_{out2}	3.407 V _{p-p}
V_{odm}	6.813 V _{p-p}
V_{idm}	198.092mV _{p-p}

$v_{in1} = v_{in2} = 4V_{p-p}$ için :

V_{out1}	8.1 mV _{p-p}
V_{out2}	8.1 mV _{p-p}
V_{icm}	7.9238 V _{p-p}
$A_{vcm-se1}$	7.5153