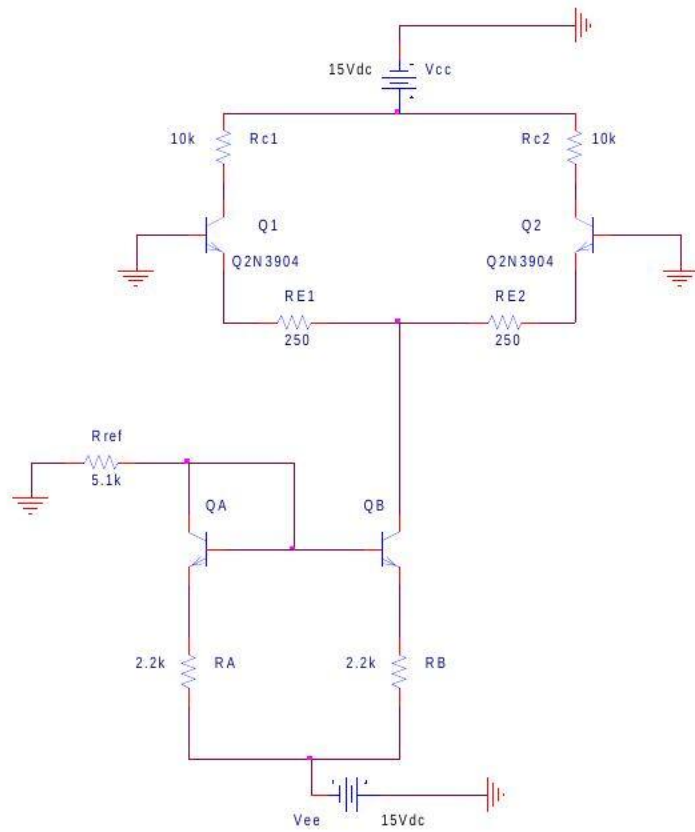
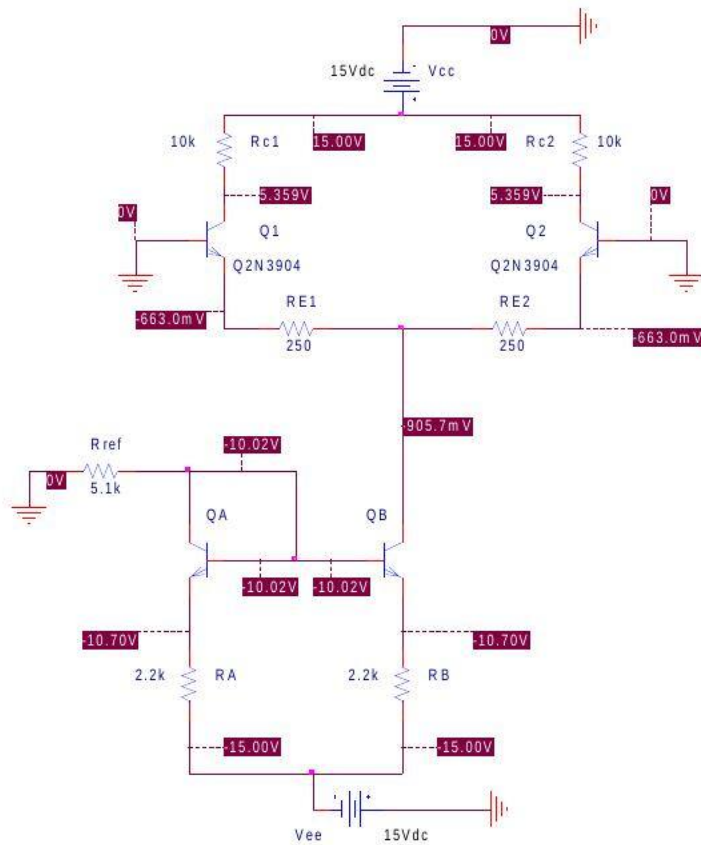


3. a) Standart direnç değerleriyle kurulan devre ;

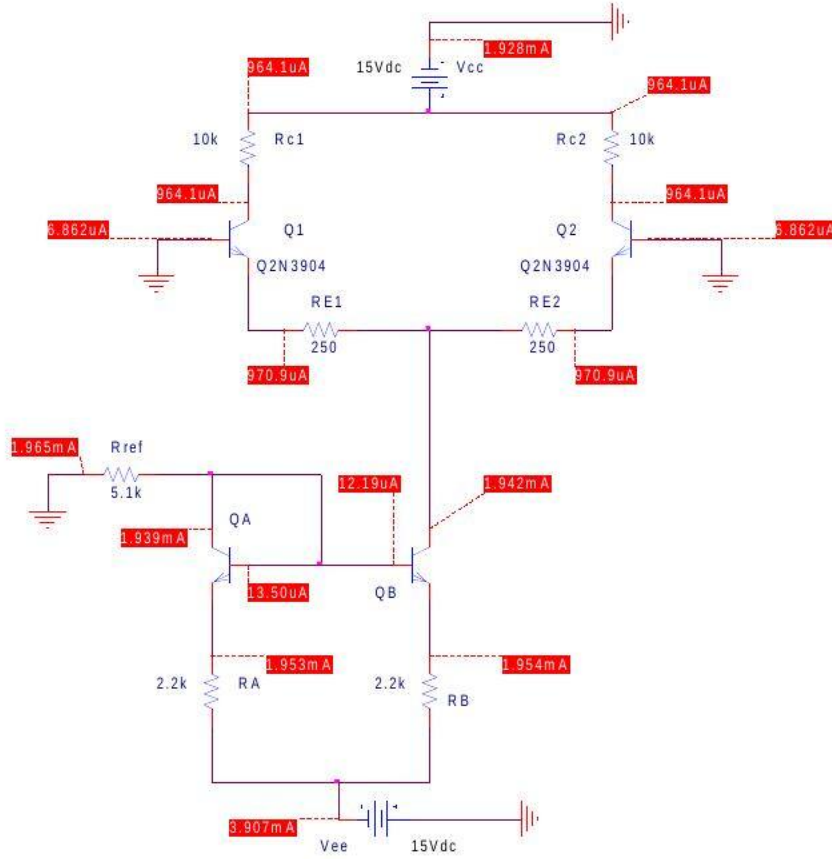


b) DC voltajlar



$$V_{CE1,2} = 5.359 \text{ V} - (-663 \text{ mV}) = 6.022 \text{ V}$$

DC akımlar

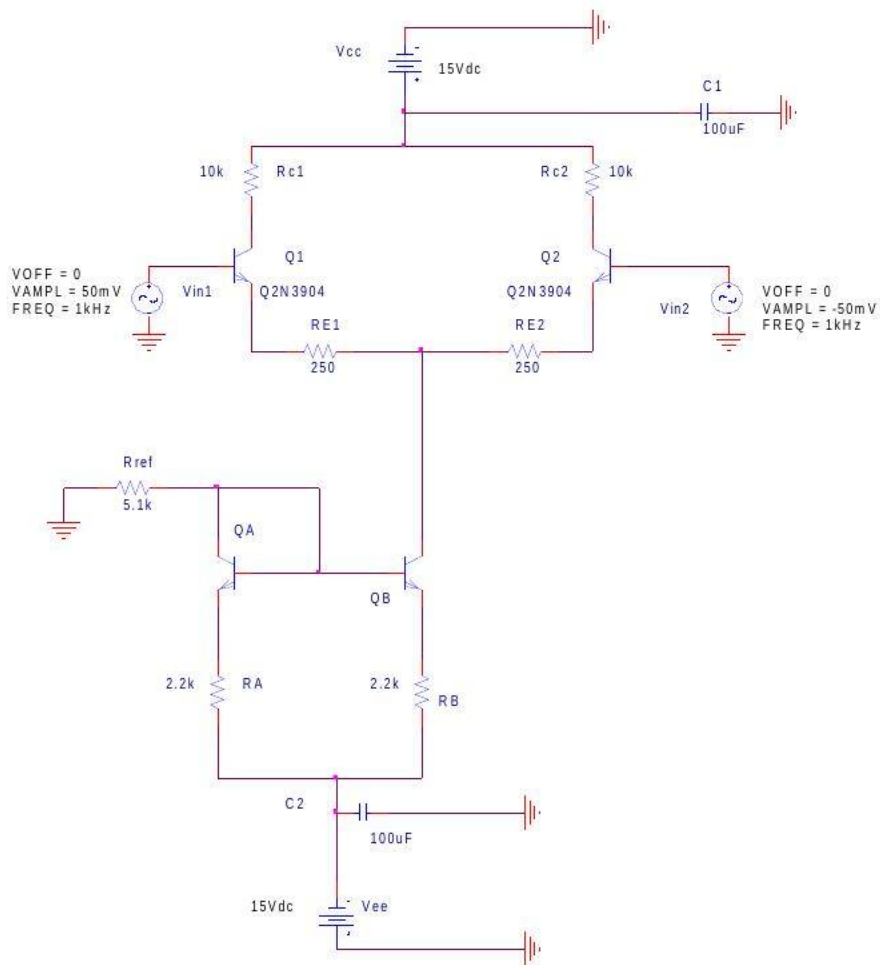


$$I_{CQ1,2} = 964.1 \mu\text{A}$$

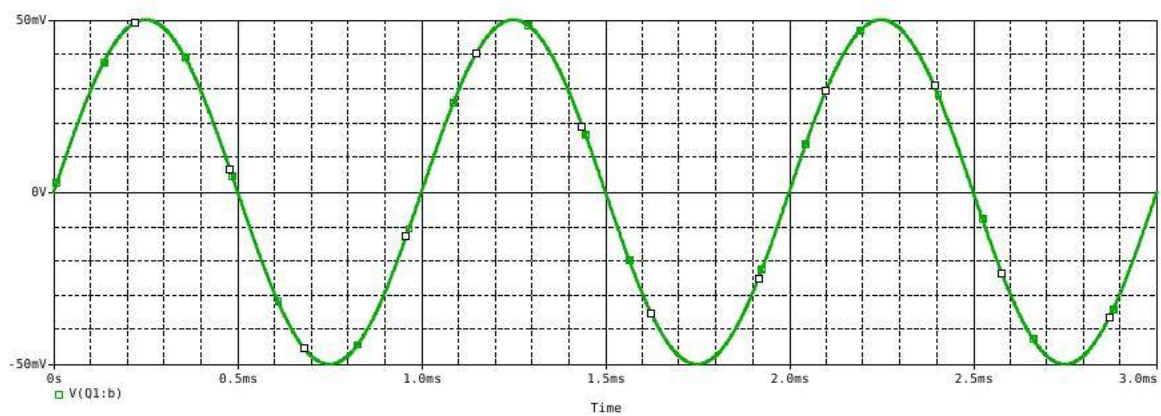
$$I_{CQA,B} = 1.939 \text{ mA}$$

Sonuç olarak dc analizde bulduğumuz sonuçlar , ön çalışmada ve deney föyünde verilen bilgiler ile tutarlı çıkmıştır. $V_{CE1,2}$ yaklaşık 6V , $I_{CQ1,2}$ yaklaşık 1 mA ve $I_{CQA,B}$ yaklaşık 2mA olarak bulunmuştur.

c) Transient simulation

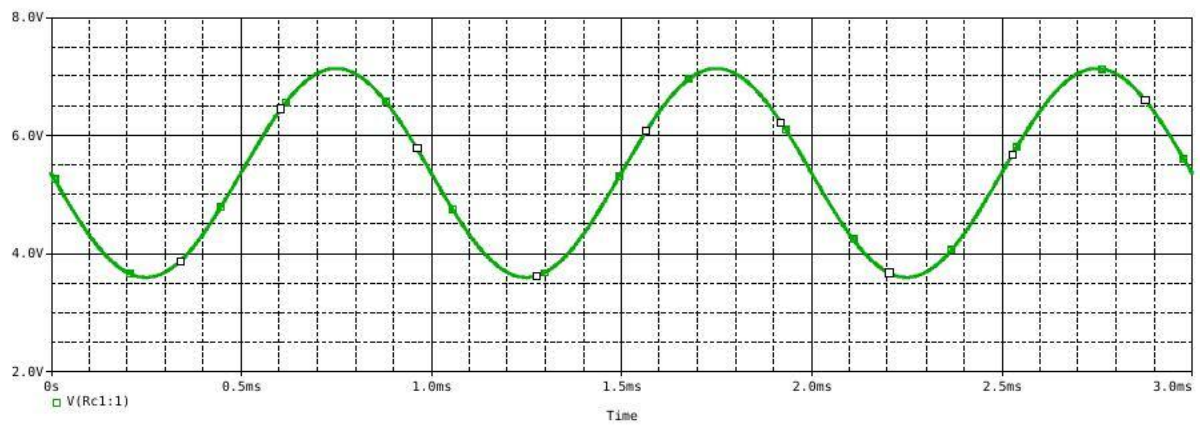


V_{in1} grafiği ;



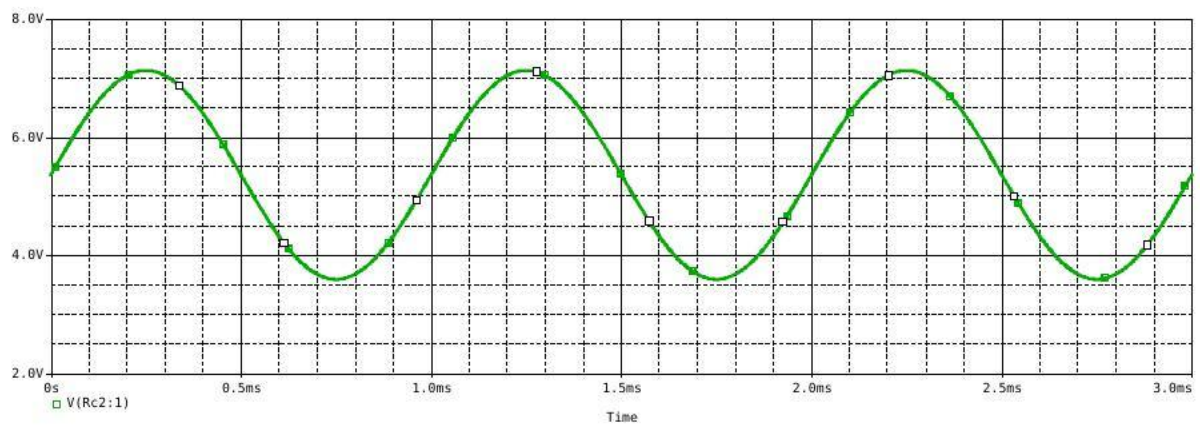
$$V_{in1} = 50 \text{ mV}_{\text{peak}}$$

V_{out1} grafiği;



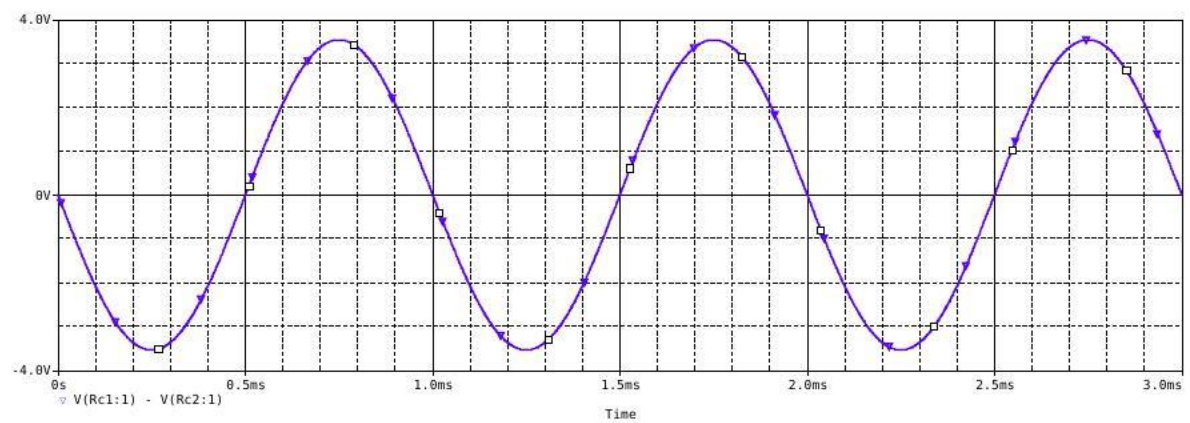
$$V_{out1} = -3.54 V_{p-p}$$

V_{out2} grafiği ;



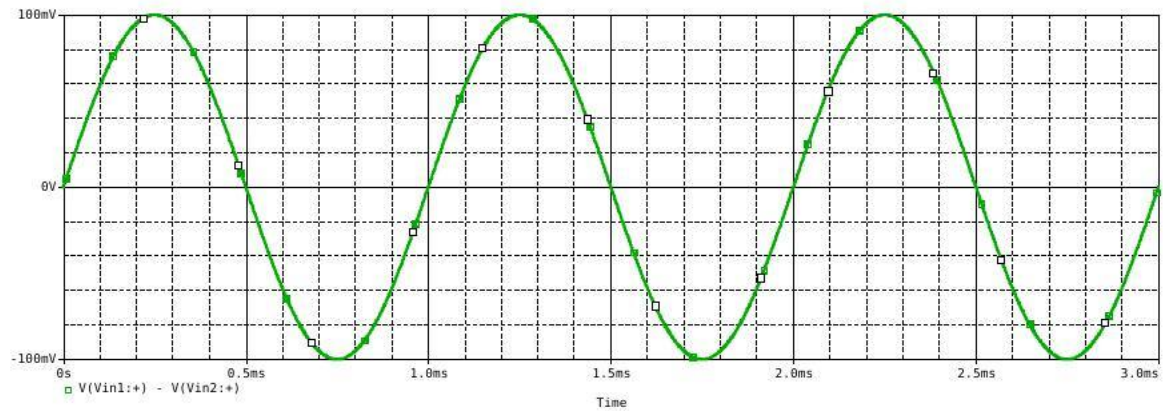
$$V_{out2} = 3.54 V_{p-p}$$

$V_{odm} = V_{out1} - V_{out2}$ grafiği ;



$$V_{odm} = 7.08 V_{p-p}$$

$V_{idm} = V_{in1} - V_{in2}$ grafiği ;



$$V_{idm} = 200 \text{ mV}_{p-p}$$

$$A_{vdm-diff} = (V_{out1} - V_{out2}) / (V_{in1} - V_{in2})$$

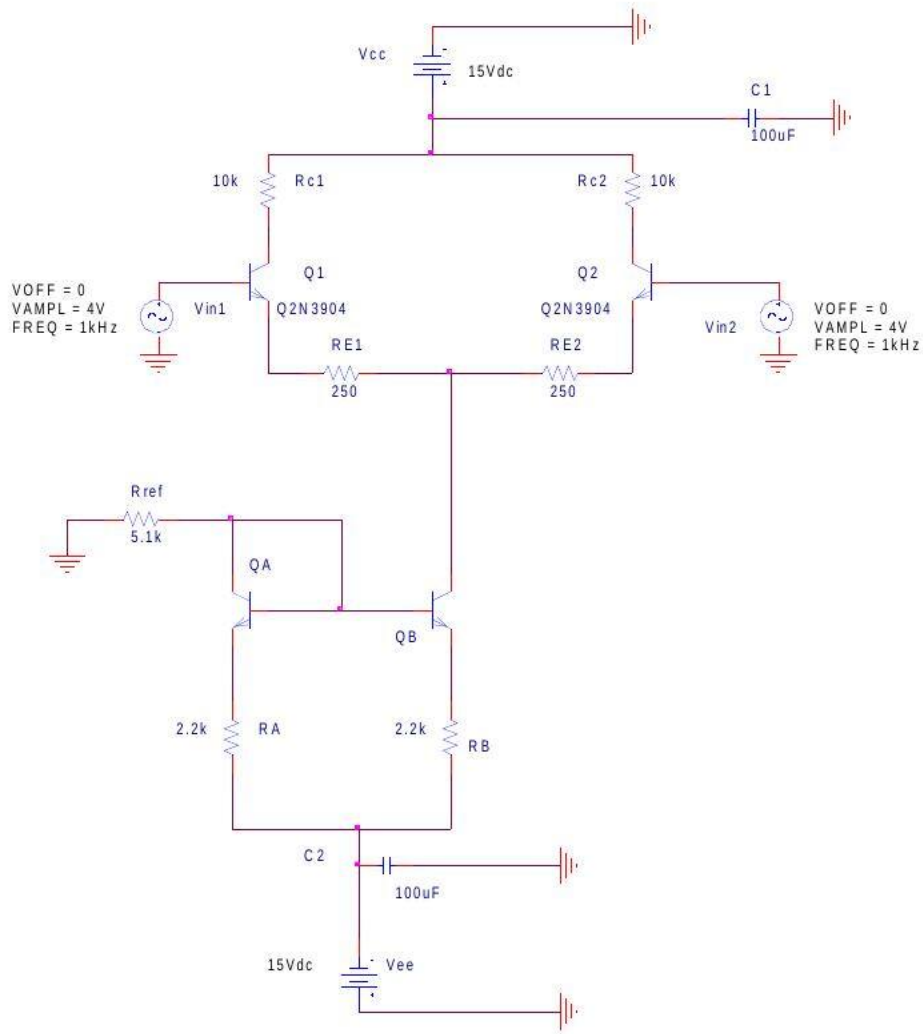
$$A_{vdm-diff} = -35.4$$

$$A_{vdm-se1} = V_{out1} / V_{idm}$$

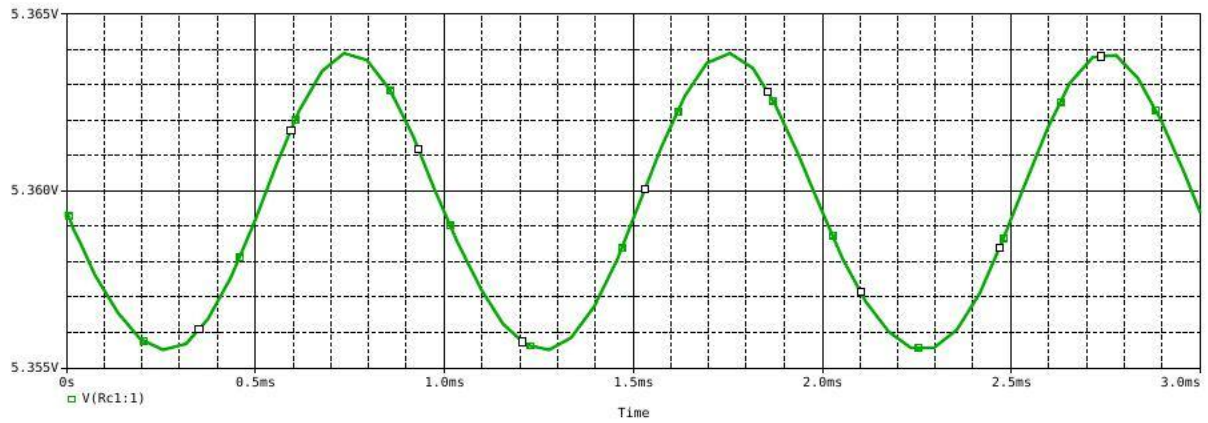
$$A_{vdm-se1} = -17.7$$

$$A_{vdm-se2} = V_{out2} / V_{idm}$$

$$A_{vdm-se2} = 17.7$$

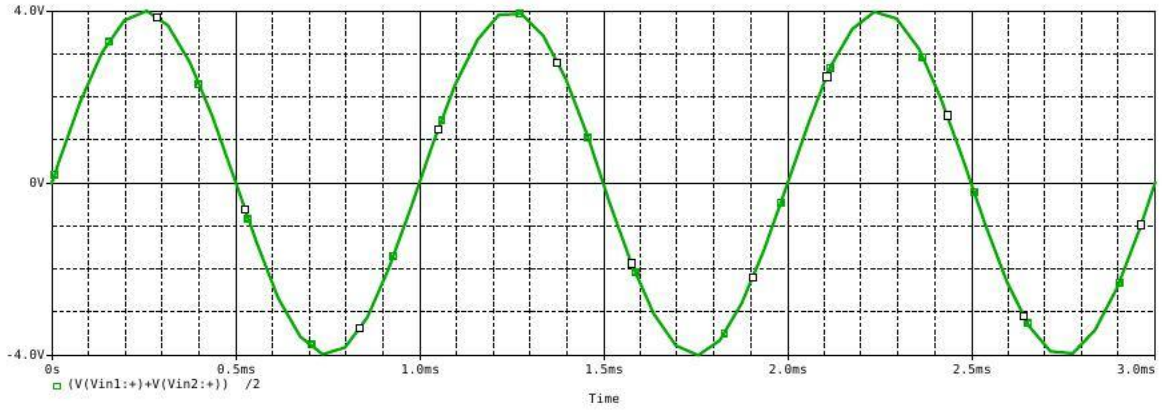


V_{out1} ve V_{out2} grafiđi ;



$$V_{out1} = V_{out2} = 8.4 \text{ mVp-p}$$

V_{icm} grafiği ;



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

$$V_{icm} = 7.96 V_{p-p}$$

$$A_{vcm-se1} = A_{vcm-se2} = V_{out1} / V_{icm}$$

$$A_{vcm-se1} = A_{vcm-se2} = -0.001$$

d) Ön çalışmada hesaplanan değerler (with hand) ;

R_C	9.7 k Ω
R_{ref}	4.88 k Ω
$A_{vdm-diff}$	-36.36
$A_{vdm-se1}$	-18.18
$A_{vdm-se2}$	18.18
R_{EE}	7.025k Ω
CMRR	25.5
$A_{vcm-se1}$	-0.69
R_{idm}	55 k Ω
R_{icm}	365 k Ω

$V_{in1} = 50 \text{ mV}_{\text{peak}}$ ve $V_{in2} = -50 \text{ mV}_{\text{peak}}$ için pspice sonuçları ;

R_C	10 k Ω
R_{ref}	5.1 k Ω
$A_{\text{vdm-diff}}$	-35.4
$A_{\text{vdm-se1}}$	-17.7
$A_{\text{vdm-se2}}$	17.7
V_{out1}	-3.54 V _{p-p}
V_{out2}	3.54 V _{p-p}
$I_{CQA,B}$	1.939 mA
$I_{CQ1,2}$	964.1 μ A
V_{odm}	7.08 V _{p-p}
V_{idm}	200 mV _{p-p}

$V_{in1} = 4 \text{ V}_{\text{peak}}$ ve $V_{in2} = 4 \text{ V}_{\text{peak}}$ için pspice sonuçları ;

$A_{\text{vcm-se1}}$	-0.001
V_{out1}	8.4 mV _{p-p}
V_{out2}	8.4 mV _{p-p}
V_{icm}	7.96 V _{p-p}