Electronics and Communications Department

Analog Electronics

Lab 5

Differential Amplifier

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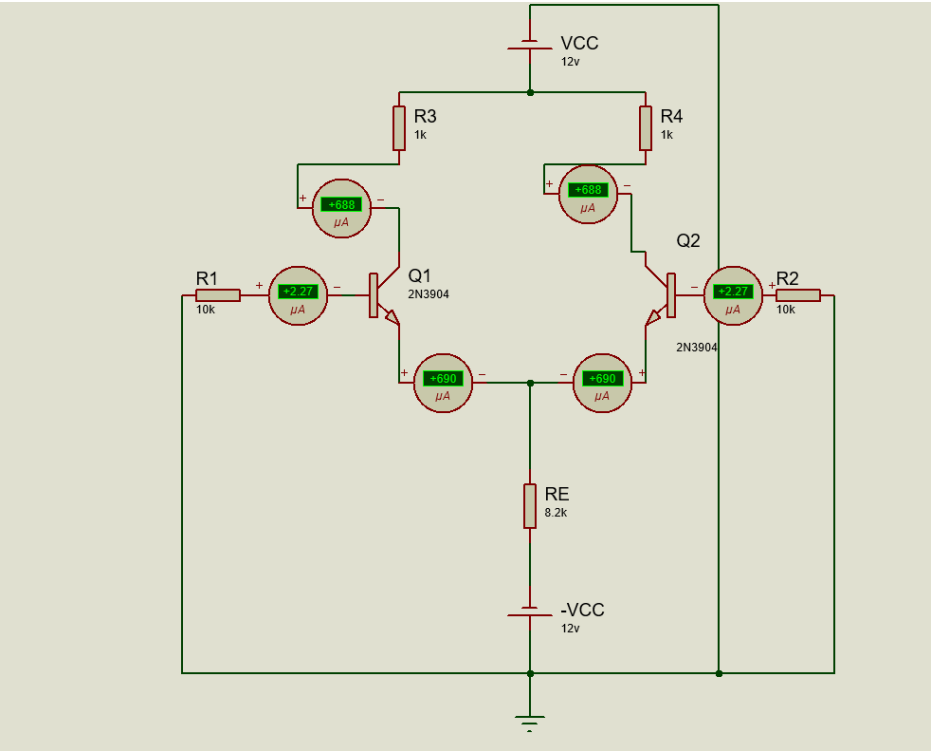
Section	**4**
Date	**9/5/2023**

- **Part I (DC measurements)**

❖ from the circuit shown in the figure.



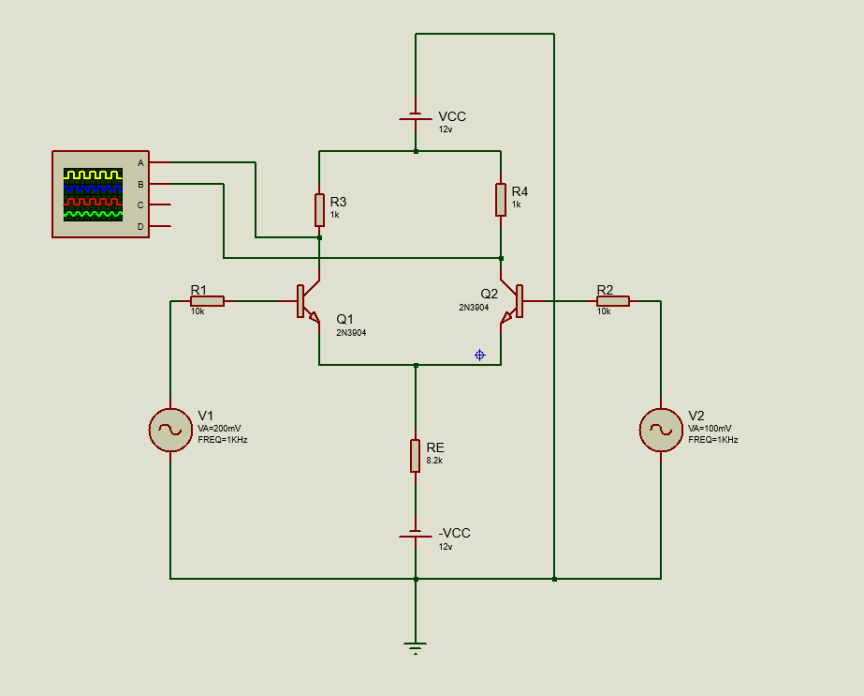
○ we get the DC measurements as shown in the table below.

-Assume V_T=26mV

I_{C1}	I_{E1}	I_{B1}	β	$r_e=\frac{V_T}{I_E}$	$g_m=\frac{I_C}{V_T}$
0.688mA	0.69mA	2.27µA	303	37.6Ω	26.4mA/V

- **Part II (AC)**

  ❖ The circuit after connecting 2 AC sources.



$r_\pi = \frac{V_T}{I_B}$ =11.45 KΩ , $r_{ie} = \frac{R_B + r_\pi}{1+\beta} + r_e$ =108.16 Ω

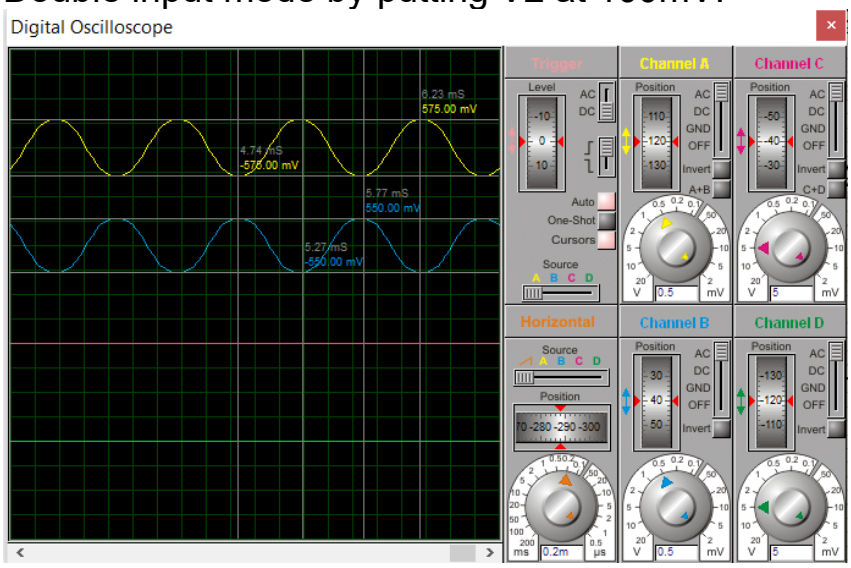
$A_{v_{dm}} = \frac{-R_C}{r_{ie}}$ = -9.24 V/V , $A_{v_{cm}} = \frac{-R_C}{2R_E}$ = -0.05 V/V

CMRR=$\frac{A_{v_{dm}}}{A_{v_{cm}}}$ = 184.8 = 45.3 dB

➢ Now we will see the three modes of the Differential Amplifier:

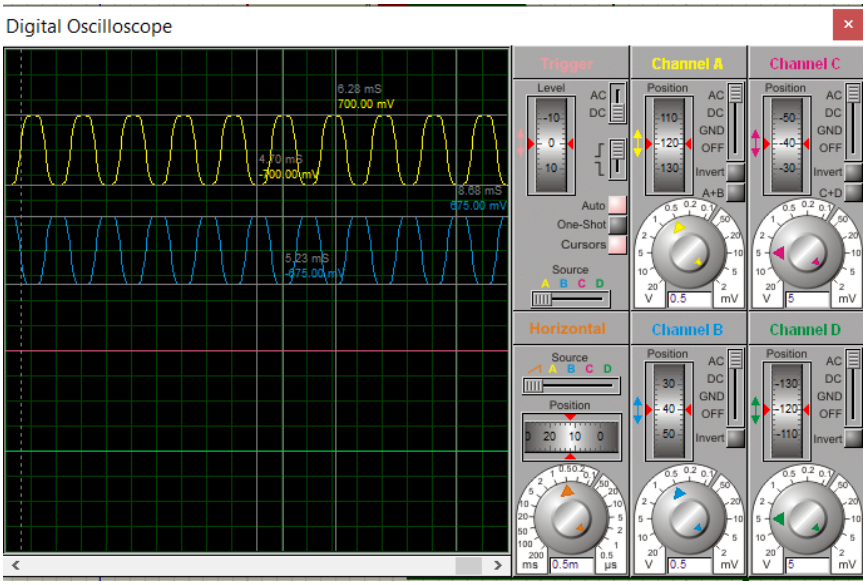
-Assume V1 at 200mV in the three cases.

a) Double input mode by putting V2 at 100mV.



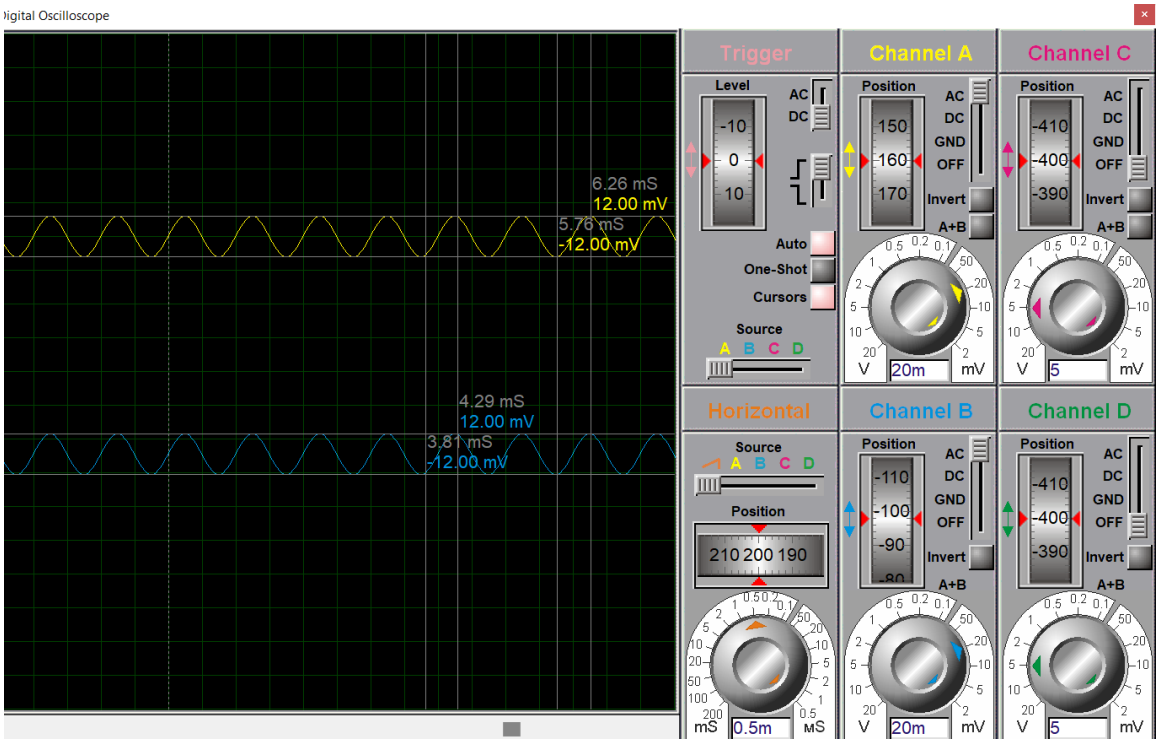
We get V_{o1}= 575mV , V_{o2} = 550mV

b) Single input mode by deleting V2 source and connecting R2 to the ground.



We get V_{o1}= 700mV , V_{o2} = 675mV

c) Common input mode by connecting R2 to V1 (the same source for 2 input).



We get V_{o1}= 12mV , V_{o2} = 12mV

V_1	V_2	V_{o1}	V_{o2}	$A_V = \frac{V_{o1}-V_{o2}}{V_1-V_2}$
200mV	100mV	575mV	550mV	$A_{v_{dm}} = \frac{575-(-550)}{200-100} = 11.25$
200mV	0	700mV	675mV	$A_{v_{dm}} = \frac{700-(-675)}{200-0} = 6.875$
200mV	200mV	0	0	$A_{v_{cm}} = 0$