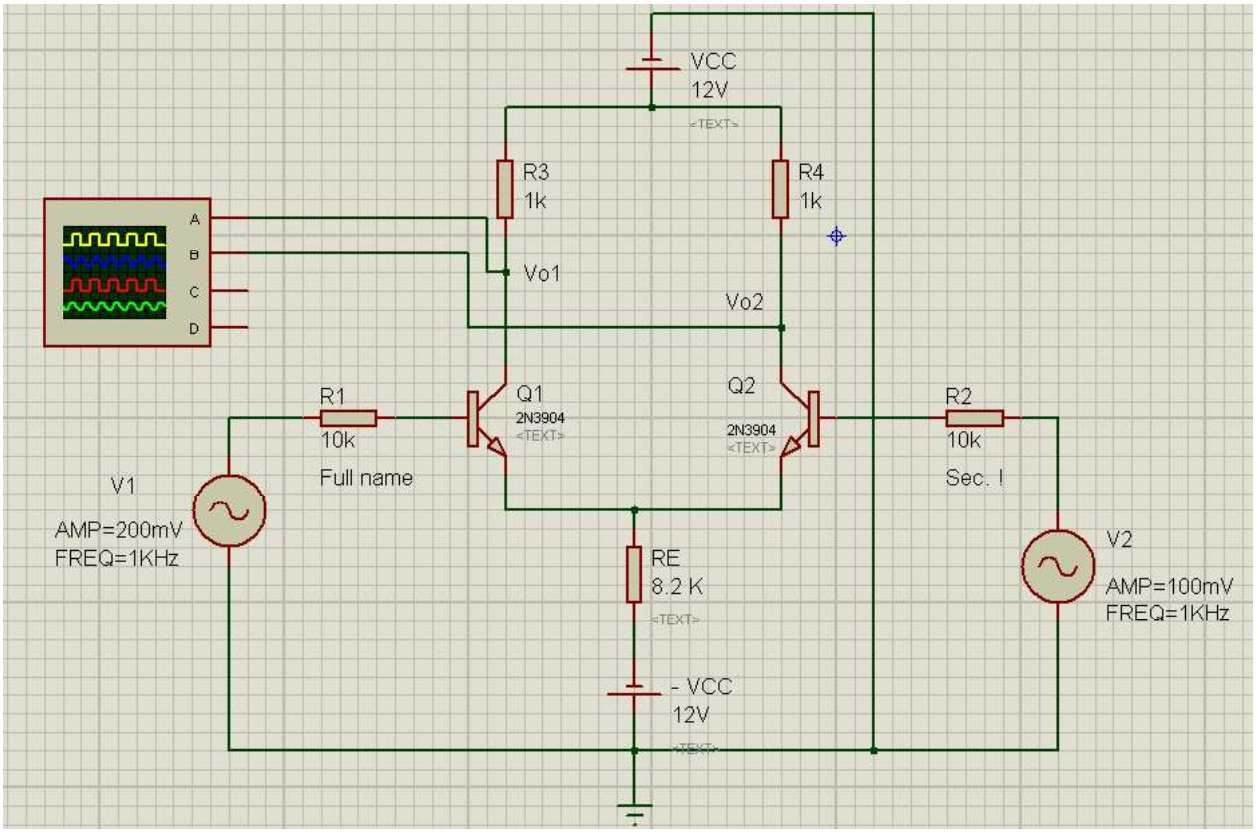
Exp. 2 (Analog) – Differential Amplifier



Steps:

1- Implement the circuit as the figure.

2- Add your full name to R1 text, and Sec. to R2 text (without delete the description), and change the style to COMPONENT ID.

3- Get I_{C1} , I_{E1} , I_{B1} with Ammeter. Then calculate β, r_e , g_m and fill Table 1.

4- Fix V1 at 200mV and fill Table 2 (Vo1 and Vo2) at the three modes of the Differential Amplifier:

   a- Double input mode by putting V2 at 100mV (lick the figure).

   b- Single input mode by deleting V2 source and connect R2 to the ground.

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

5- Right click oscilloscope figure and chose Digital oscilloscope. Put all oscilloscope's channels Off except Ch. B to calculate Vo2. Then change Ch. A to be AC and calculate Vo1 (Important order).

6- Take 3 screen for the Oscilloscope results at the three modes. Then print them in 1 page, and don't present results without your name (it's really dangerous).

7- Calculate Av_{dm}, Av_{cm}, and $CMRR$ and compare it with simulation results.

DC Analysis	I_{C1}	I_{E1}	I_{B1}	β	$r_e = \frac{V_T}{I_E}$	$g_m = \frac{I_C}{V_T}$
Simulation	0.688mA	0.69mA	2.27uA	303	37.6 ohm	26.4mA/V
Measurements						

Table 1

V1	V2	Vo1	Vo2	$Av = \frac{Vo1}{V1-V2}$
200mV	100mV	575mV	550mV	$Av_{dm} = \frac{575-(-550)}{200-100} = 11.25$
200mV	0	700mV	675mV	$Av_{dm} = \frac{700-(-675)}{200} = 6.875$
The same source (200mV)		0	0	$Av_{cm} = 0$

Table 2

$r_\pi = \frac{V_T}{I_B} =$ 11.45K ohm, $rie = \frac{R_B + r_\pi}{1+\beta} + r_e =$ 108.16 ohm

$Av_{dm} = \frac{-Rc}{rie} =$ -9.24, $Av_{cm} = \frac{-Rc}{2RE} =$ -0.05

$CMRR = \frac{Av_{dm}}{Av_{cm}} =$ 184.8, 45.3 dB