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Lab 6

1. Measurement of offset voltage and bias currents

(a) Measurement of V_{os}

(i) $$V_o = V_{os}\left(1 + \frac{R_2}{R_1}\right) + R_2 I_B^-$$

(ii) For dominating V_{os} with negligible I_B^- $\Rightarrow$

$$V_{os} = \frac{V_o}{1 + \frac{R_2}{R_1}} \simeq \frac{V_o}{R_2/R_1}$$

(iii) $R_1 = 10.2\,\Omega$ $\qquad$ $R_2 = 10\,K\Omega$

(iv) $V_o = 9\,mV$

$$\Rightarrow V_{os} = \frac{9\,mV}{10K\Omega/10.2\Omega} = \frac{9\,mV \times 10.2}{10\,K} = 9.18 \times 10^{-6}\,V$$

$$= 9.18\,\mu V$$

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(b) Measurement of bias current I_B^-

(ii) $V_- = V_+ \Rightarrow V_o = V_- + I_B^- R = V_{os} + I_B^- R$

(iii) $R = 10\,M\Omega \quad \Rightarrow \quad I_B^- = \frac{V_o}{R}$

(iii) $R = 10.17\,M\Omega \qquad V_o = 0.5\,V$

$$\Rightarrow I_B^- = \frac{0.5}{10.17 \times 10^6} = 0.0491 \times 10^{-6}\,A$$

$$= 0.0491\,\mu A$$

$$= 49.1\,nA$$

(c) Measurement of bias current I_B^+

(i) $V_+ = I_B^+ R + V_{os}$

$V_o = V_- = V_+ = I_B^+ R + V_{os}$

(ii) $R = 10\,M\Omega \Rightarrow I_B^+ = \frac{V_o}{R}$

(iii) $R = 10.17\,M\Omega \quad V_o = -0.5\,V$

$\Rightarrow I_B^+ = \frac{-0.5}{10.17\,M\Omega} = -49.1\,nA$

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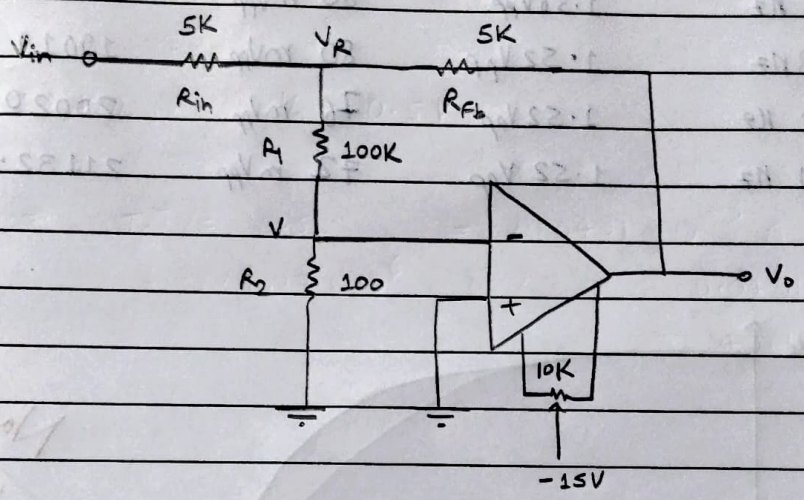
2. Measurement of Open-loop gain

(i) $R_{in} = 5K\Omega$ $Pot = 10K\Omega$ $R_2 = 100\Omega$

$R_1 = 99.5\ K\Omega$ $R_{Fb} = 5K\Omega$



(ii) $V_o = 0$

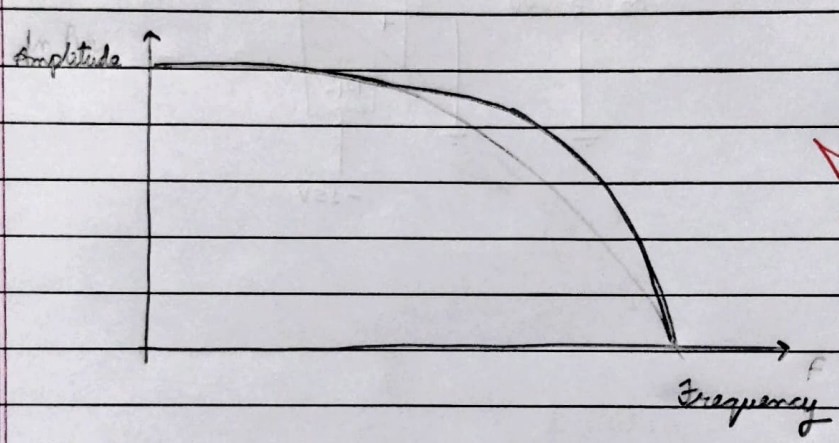
(iii) $V_o = -982.4\ mV$

(iv) $|A_{OL}| = \left|\frac{V_o}{V_R}\right| \frac{R_1+R_2}{R_2}$ $\frac{R_1+R_2}{R_2} = \frac{100K+100}{100} = 1001$

Freq.	V_o	V_R	A_{OL}
10 kHz	100 mVpp	8 Vpp	12.5125
1 kHz	800 mVpp	6.6 Vpp	121.33
500 Hz	1.2 Vpp	4.92 Vpp	244.1463
100 Hz	1.56 Vpp	1.32 Vpp	1183
20 Hz	1.56 Vpp	280 mVpp	5577
10 Hz	1.52 Vpp	200 mVpp	7607.6

Freq	V_o	V_p	A_{OL}
9 Hz	1.56 V_{pp}	200 mV_{pp}	7807.8
8 Hz	1.56 V_{pp}	200 mV_{pp}	7807.8
7 Hz	1.56 V_{pp}	160 mV_{pp}	9759.75
6 Hz	1.56 V_{pp}	108 mV_{pp}	13717.4074
5 Hz	1.56 V_{pp}	100 mV_{pp}	15615.6
4 Hz	1.56 V_{pp}	80 mV_{pp}	19019
3 Hz	1.52 V_{pp}	80 mV_{pp}	19019
2 Hz	1.52 V_{pp}	76 mV_{pp}	20020
1 Hz	1.52 V_{pp}	72 mV_{pp}	21132.22

(v)



Naman
14/02/25