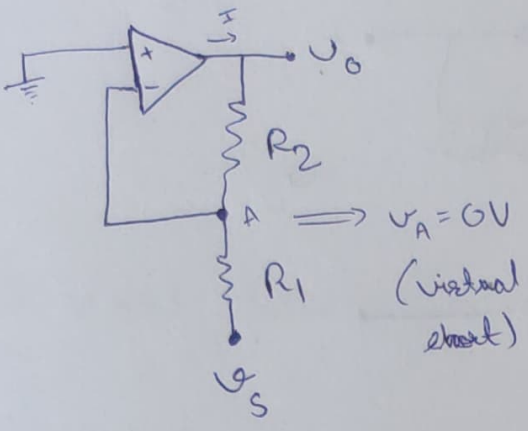
NISARG UPADHYAYA 19CS30031

Nisarg

Q1)



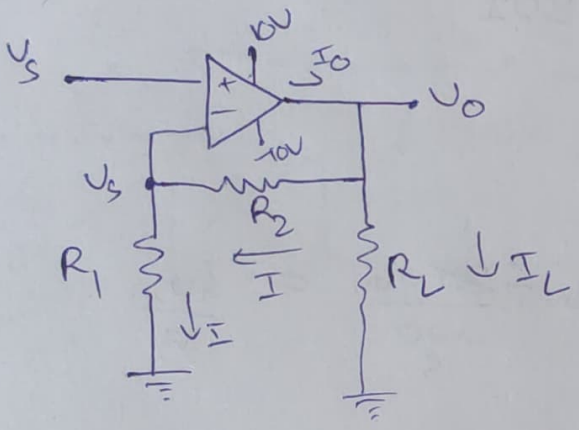
Inverting amplifier

$$A_v = -\frac{R_2}{R_1} = -\frac{20}{3.3} = -6.06$$

$$I = \frac{v_o - 0}{R_2} = \frac{(-6.06)\times 2}{20}$$

$$= -0.606\ mA$$

Q2)



$$I_0 = I + I_L$$

$$= \frac{v_s}{R_1} + \frac{v_o}{R_L}$$

$$v_o = \left(1 + \frac{R_2}{R_1}\right) v_s$$

$$\Rightarrow I_0 = \left(1 + \frac{R_2}{R_1}\right)\frac{v_s}{R_L} + \frac{v_s}{R_1}$$

Also $v_{out} \le v_{supply}$

$$\Rightarrow \left(1 + \frac{R_2}{100}\right) 2 \le 10$$

$$\Rightarrow R_2 \le 400k\Omega$$

$$\Rightarrow I_0 \text{ at } R_2 = 400k\Omega$$

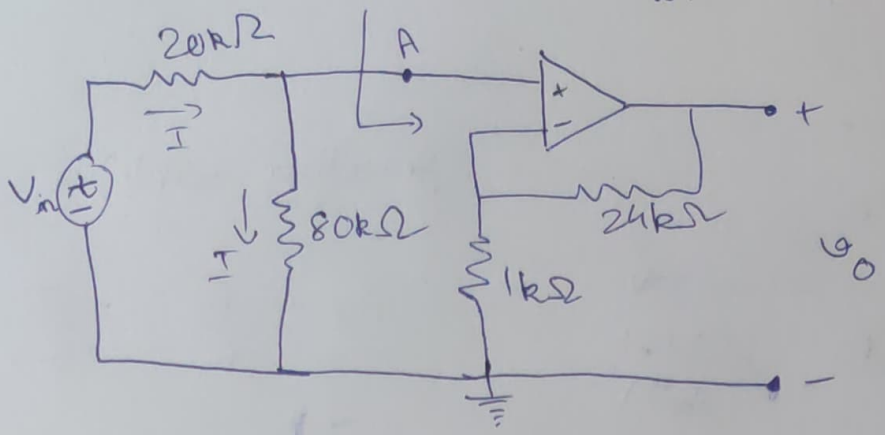
$$I_0 = \left(1 + \frac{400}{100}\right)\frac{2}{10} + \frac{2}{100}$$

$$= 1 + 0.02\ mA$$

$$= 1.02\ mA$$

Q3)

NON INVERTING AMPLIFIER WITH INPUT v_A



$$\Rightarrow v_o = v_A\left(1+\frac{R_2}{R_1}\right) = v_A\left(1+\frac{24}{1}\right) = 25v_A$$

$$v_A = v_{in} - 20I$$

$$I = \frac{v_{in}}{100}$$

$$\Rightarrow v_A = v_{in} - \frac{20\,v_{in}}{100} = \frac{4v_{in}}{5}$$

$$\Rightarrow v_o = 25 \times \frac{4v_{in}}{5} \Rightarrow A_v = \frac{v_o}{v_{in}} = 20$$

Q4)

$$CMRR = 50.5 = 20\log\left|\frac{A_d}{A_{cm}}\right|$$

$$= 20\log|A_d| - 20\log|A_{cm}|$$

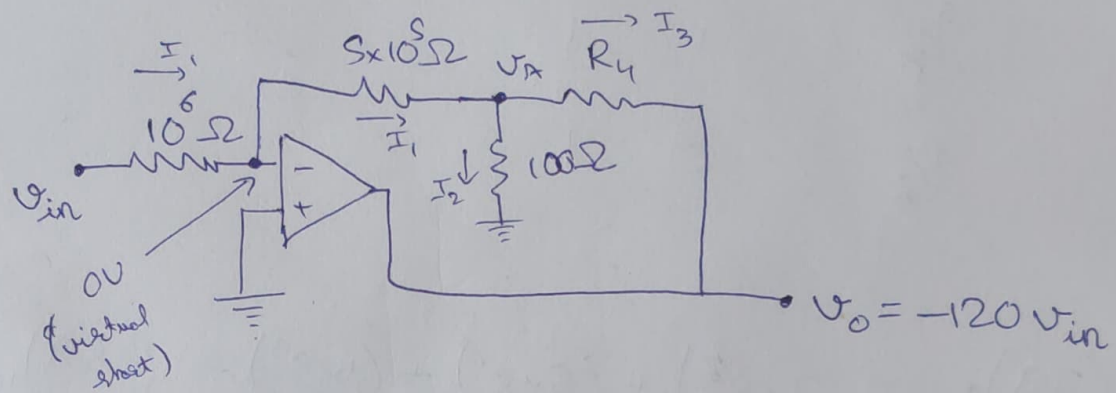
$$= 52 - 20\log|A_{cm}|$$

$$\Rightarrow 20\log|A_{cm}| = 52 - 50.5 = \underline{1.5\,dB}$$

Q5) Germanium (Ge)

Q6) SQUARE WAVE → 180° out of phase with input sine wave.

Q7)



$$I_1 = I_2 + I_3$$

$$I_1 = \frac{v_{in}}{10^6} = \frac{-v_A}{5\times10^5} \Rightarrow v_A = \frac{-5\times10^5}{10\times10^5}\,v_{in}$$

$$= -\frac{v_{in}}{2}$$

$$\frac{v_{in}}{10^6} = \frac{\left(\frac{-v_{in}}{2}\right)}{100} + \frac{\left(\frac{-v_{in}}{2} - (-120\,v_{in})\right)}{R_4}$$

$$\frac{1}{10^6} = \frac{-1}{200} + \frac{120-\frac{1}{2}}{R_4} = \frac{-1}{200} + \frac{239}{2R_4}$$

$$\frac{239}{2R_4} = \frac{1}{10^6} + \frac{1}{200} = 0.005001$$

$$\frac{2R_4}{239} = 199.96 \Rightarrow R_4 = 23895.22\,\Omega$$

Q8) $(12AA)_{16} = (1\times16^3)+(2\times16^2)+(10\times16^1)+(10\times16^0)$

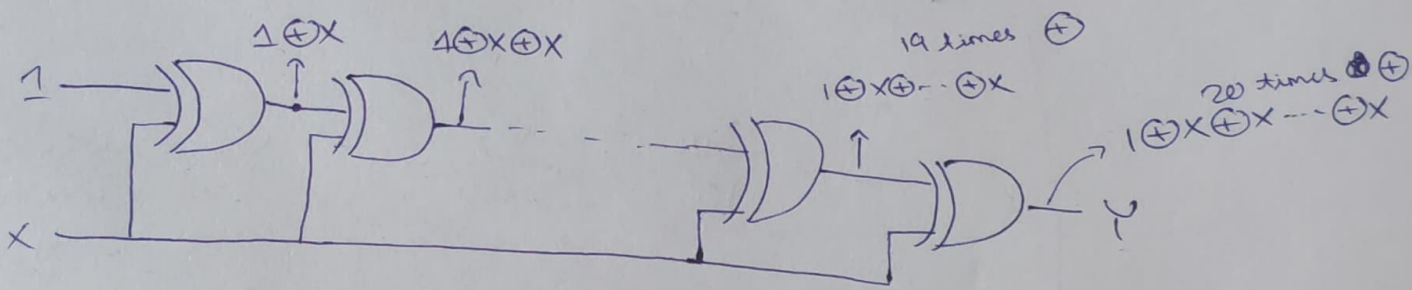
$= (4778)_{10}$

DIVISION	Q	R
$4778/8$	597	2
$597/8$	74	5
$74/8$	9	2
$9/8$	1	1
$1/8$	0	1

$\Rightarrow (12AA)_{16} = (11252)_8$

$(751)_8 = (7\times8^2)+(5\times8^1)+(1\times8^0) = (489)_{10}$

Q9)



Now $X \oplus X = 0$

$0 \oplus X = X$

$Y = 1 \oplus (\underbrace{X \oplus X \oplus \cdots \oplus X}_{19 \oplus \text{ inside}}) = 1 \oplus 0 = 1$

Odd number of ⊕ will make this 0

Q10)

$$\Pi(0,1,2,4,5,6,8,9,10)$$

$$= \Sigma(3,7,11,12,13,14,15)$$

$$F = \bar{a}\bar{b}cd + \bar{a}bcd + a\bar{b}cd + ab\bar{c}\bar{d} + ab\bar{c}d + abc\bar{d} + abcd$$

K-MAP

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	0	1	0
$\bar{A}B$	0	0	1	0
AB	1	1	1	1
$A\bar{B}$	0	0	1	0

Simplified

$\Rightarrow ab + cd$