Sheet #

LGS GROUP OF COLLEGES

A PROJECT OF LAHORE GRAMMAR SCHOOL

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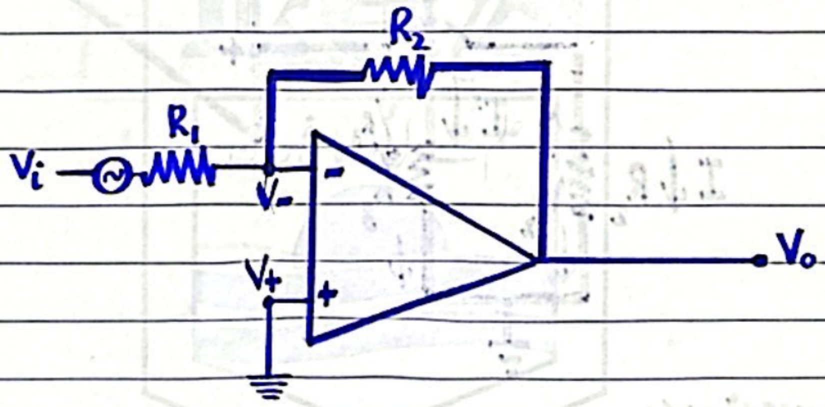
Subject: Physics Test No. WT8 Assignment Date: 20/11/24

	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D	Marks Obtained
1					6					11					16					
2					7					12					17					
3					8					13					18					
4					9					14					19					
5					10					15					20					

Assignment

(Question#1)

$(V_- \approx V_+)$



Proof:

Consider an operational amplifier V_+ as grounded,

So, $V_+ \approx 0$,

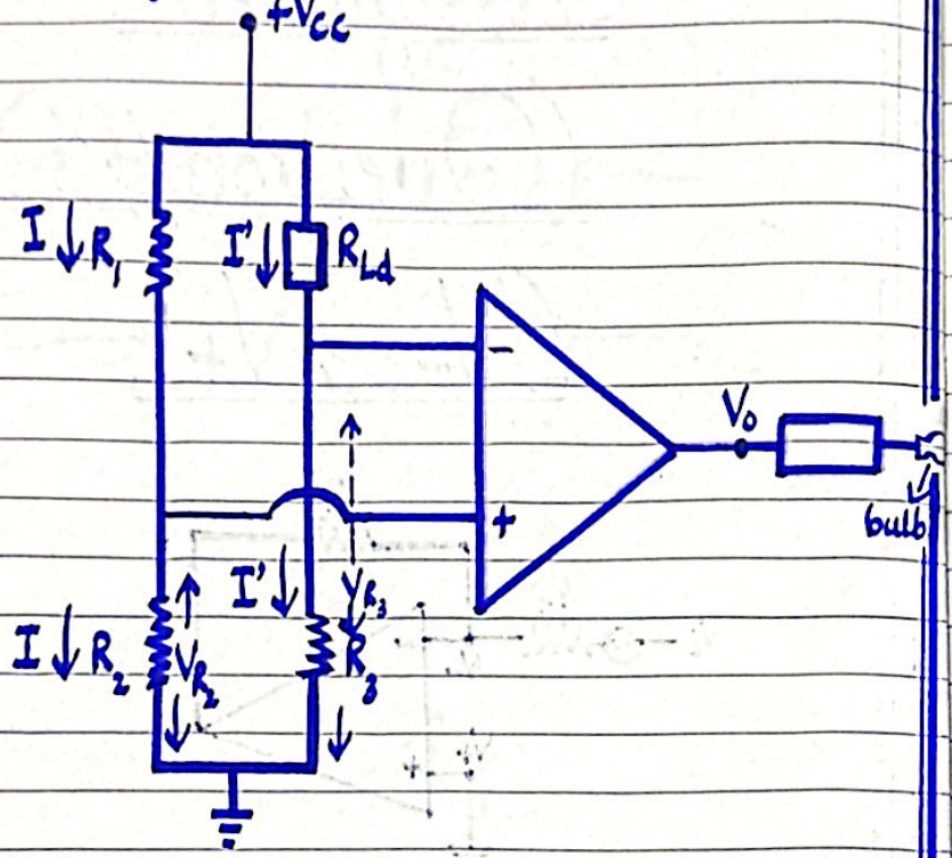
Also using, $A_{OL} = \frac{V_o}{V_+ - V_-} \Rightarrow V_+ - V_- = \frac{V_o}{A_{OL}}$

$$V_+ - V_- = \frac{V_o}{10^5} = \frac{V_o}{\text{very high value}} \approx 0 \quad \text{So, } V_+ - V_- \approx 0$$

$V_+ \approx V_-$ or $V_- \approx V_+$, So, V_+ is particularly grounded and V_- is virtually grounded because of its equality with V_+.

(Question#2)
(OP amp as Night Switch)

Circuit diagram:



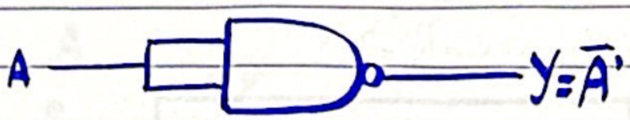
Expressions:

$V_+ = V_{R_2}$	$V_- = V_{R_3}$
$V_{R_2} = $ (Current through R_2)(resistance)	$V_{R_3} = $ (Current through R_3)(resistance)
$V_{R_2} = (I)(R_2)$	$V_{R_3} = (I')(R_3)$
$V_{R_2} = \left(\frac{V_{CC}}{R_1+R_2}\right)(R_2)$	$V_{R_3} = \left(\frac{V_{CC}}{R_L+R_3}\right)(R_3)$
$V_{R_2} = \left(\frac{R_2}{R_1+R_2}\right)(V_{CC})$	$V_{R_3} = \left(\frac{R_3}{R_L+R_3}\right)(V_{CC})$
So, $V_+ = V_{R_2} = \left(\frac{R_2}{R_1+R_2}\right)V_{CC}$	$V_- = V_{R_3} = \left(\frac{R_3}{R_L+R_3}\right)(V_{CC})$

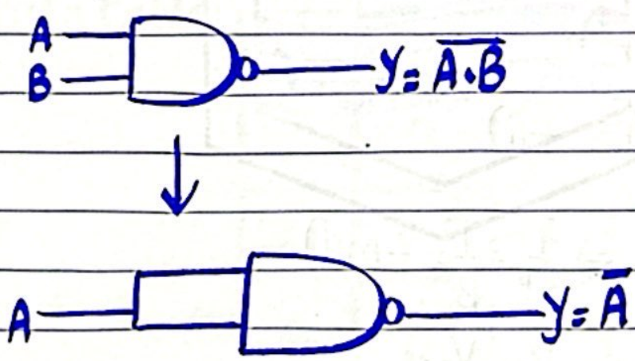
(Question#3)

(NAND gate as NOT gate)

Diagram:



We can make NOT gate from NAND gate by joining the two input terminals of NAND gate to form a single input terminal of NOT gate, and output of NOT gate is taken from output terminal of NAND gate.



Truth table:

A	B	$Y = \overline{(A \cdot B)} = \overline{A}$
0	0	1
1	1	0

Question #4

Given:

Collector current $= I_c = 10mA = 0.01A$

Current gain $: \beta = 100$

base-emitter voltage $= V_{BE} = 0.6V$

To find:

Base resistance $= R_B = ?$

Formula:

$$V_{CC} = V_{R_B} + V_{BE}$$

$$V_{CC} = I_B R_B + V_{BE} \quad (V_{R_B} = I_B R_B)$$

$$V_{CC} - V_{BE} = I_B R_B$$

$$\frac{V_{CC} - V_{BE}}{I_B} = R_B$$

$$R_B = \frac{V_{CC} - V_{BE}}{I_B} \quad -(1)$$

Using $\beta = \frac{I_c}{I_B} \Rightarrow I_B = \frac{I_c}{\beta}$ - in (1)

$$R_B = \frac{V_{CC} - V_{BE}}{I_B} = \frac{V_{CC} - V_{BE}}{I_c/\beta}$$

$$R_B = \left(\frac{V_{CC} - V_{BE}}{I_C}\right)\beta$$

Calculations: $R_B = \left(\frac{V_{CC} - V_{BE}}{I_c}\right)\beta$

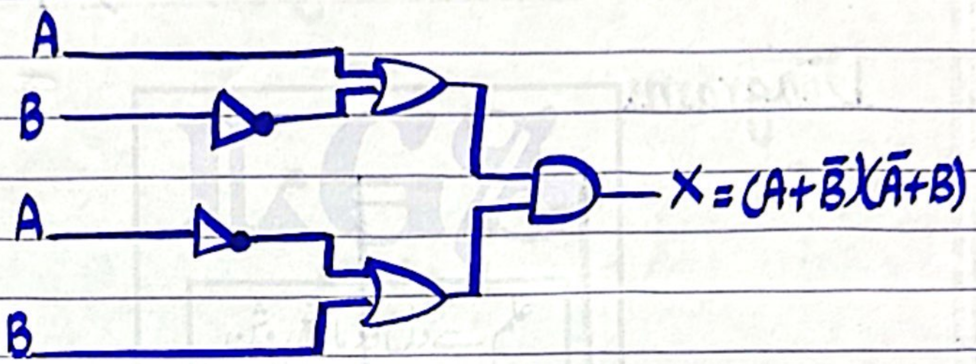
$$= \left(\frac{9 - 0.6}{0.01}\right) \times 100 = 84000\,\Omega = 84k\Omega$$

Result: Base resistance is $84k\Omega$ or 84000Ω.

(Question #5)

$(X = (A+\bar{B})(\bar{A}+B))$

Diagram:



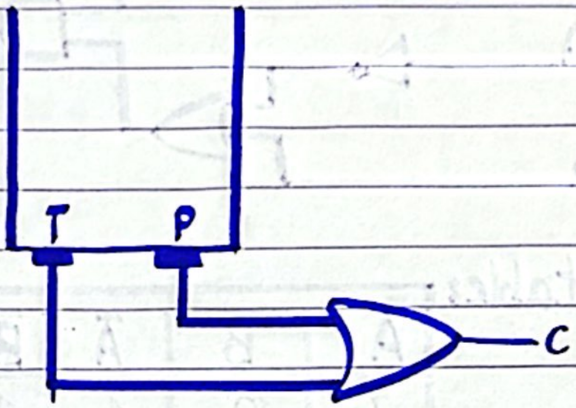
Truth table:

A	B	$\bar{A}$	$\bar{B}$	$\bar{A}+B$	$A+\bar{B}$	X
0	0	1	1	1	1	1
0	1	1	0	1	0	0
1	0	0	1	0	1	0
1	1	0	0	1	1	1

(Question#6)

(Pressure & Temperature Control System)

Diagram:



Truth table:

P	T	C
0	0	0
0	1	1
1	0	1
1	1	1