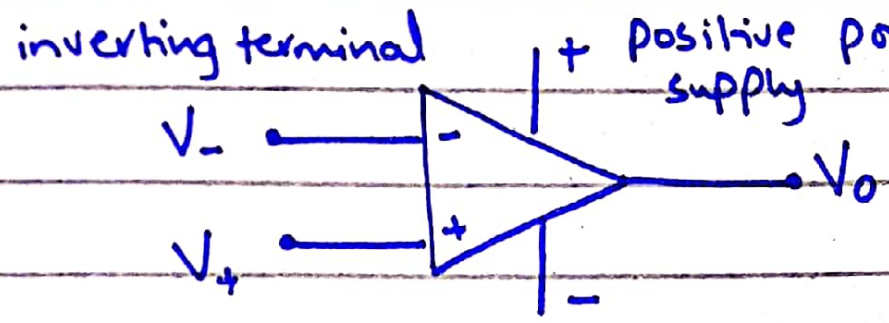
Wajeeha Manzoor
2nd Year

"Physics Assignment-Week 8"

"Subjective Type"

Ans Q1



∴ Circuit of operational amplifier

Proof:

Consider an operational amplifier with V_+ as grounded

So $V_+ \approx 0$,

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

$$V_+ - V_- = \frac{V_o}{} = \frac{V_o}{} \approx 0$$

10^5 very high value

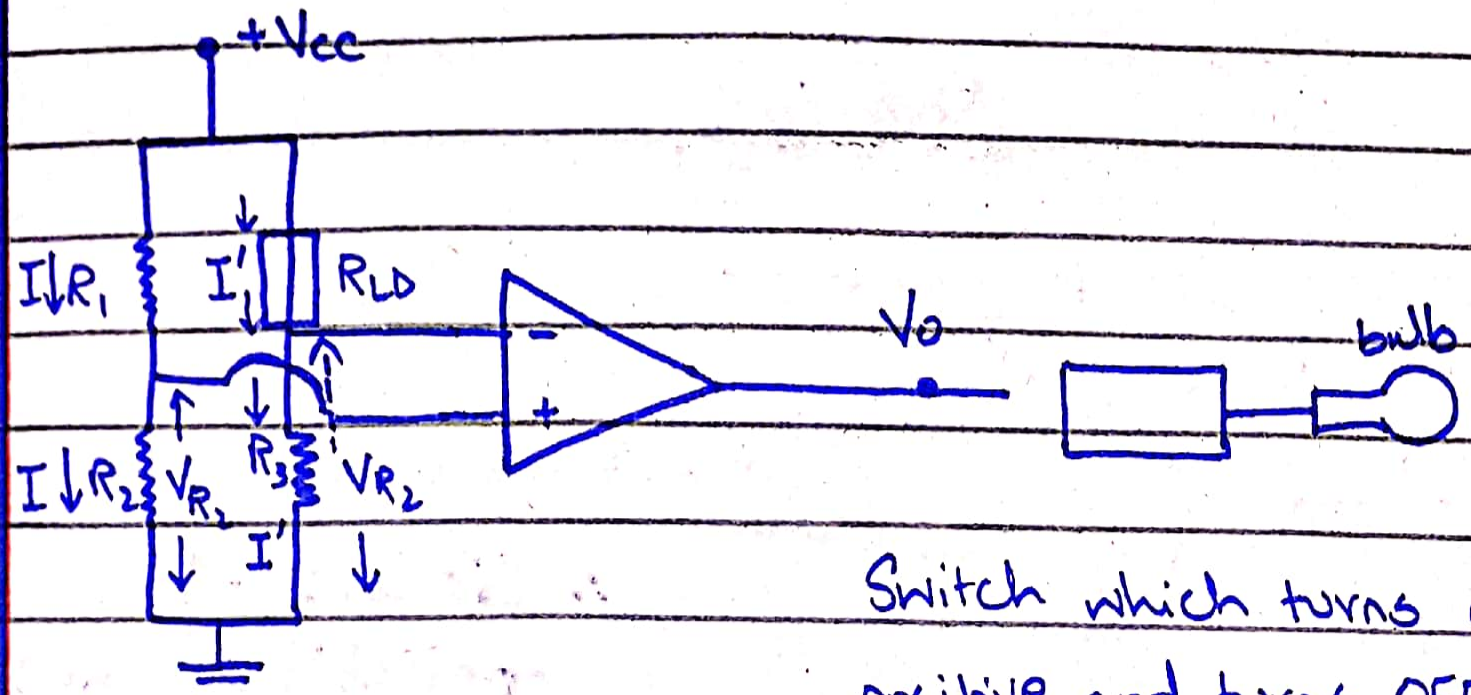
$V_+ - V_- \approx 0$

$V_+ \approx V_-$ or $V_- \approx V_+$

So V_+ is particularly grounded and V_- is virtually grounded because of its equality with V_+.

Ans Q2

Circuit of OP amp as night switch :-



Switch which turns ON at positive and turns OFF at negative potential.

Expression of V- and V+ :-

During day, intensity of light high and R_{LD} = low

V_- = greater, $V_- > V_+$, $V_o = -V_{cc}$ (OFF switch)

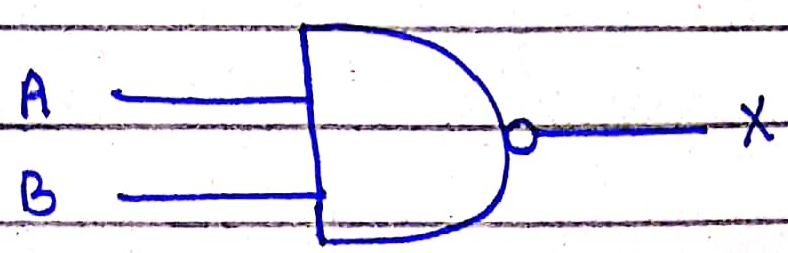
At evening, intensity of light is low and R_{LD} = high

V_- = less, $V_+ > V_-$, $V_o = +$ (ON switch)

Ans Q3

NAND Gate :-

$X = \overline{A \cdot B}$



Truth Table

A	B	$X = \overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

Ans Q4

Numerical :-

Given :

collector current = $I_C = 10mA = 0.01A$

current gain = $\beta = 200$

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

To Find :

Base - resistance = $R_B = ?$

Solution :

Using Formula,

$$V_{CC} = V_{R_B} + V_{BE} \qquad \because V_{R_B} = I_B R_B$$

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

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

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

Using $\beta = \frac{I_C}{I_B} \rightarrow I_B = \frac{I_C}{\beta}$ in eq (1)

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

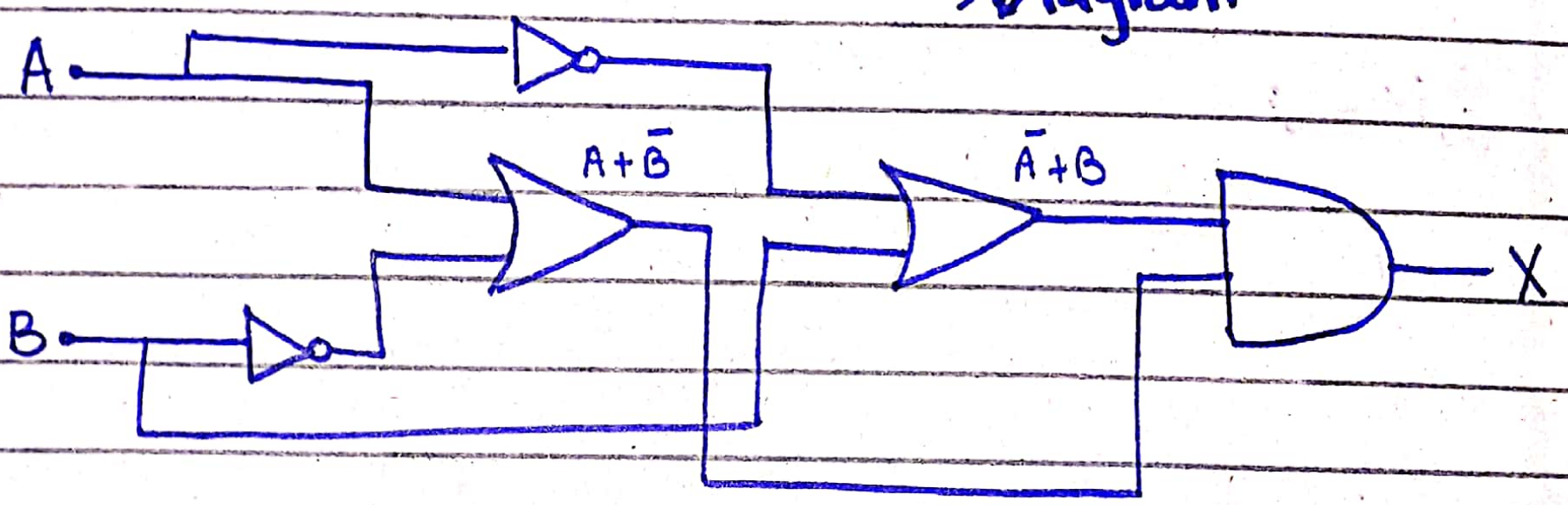
$$R_B = \left(\frac{9 - 0.6}{0.01}\right) \times 200 = 168\,000\ \Omega = 168\ k\Omega$$

Base resistance is 168 kΩ.

Ans Q5

Boolean diagram and Truth table of $X = (A + \bar{B})(\bar{A} + B)$:-

→ Diagram

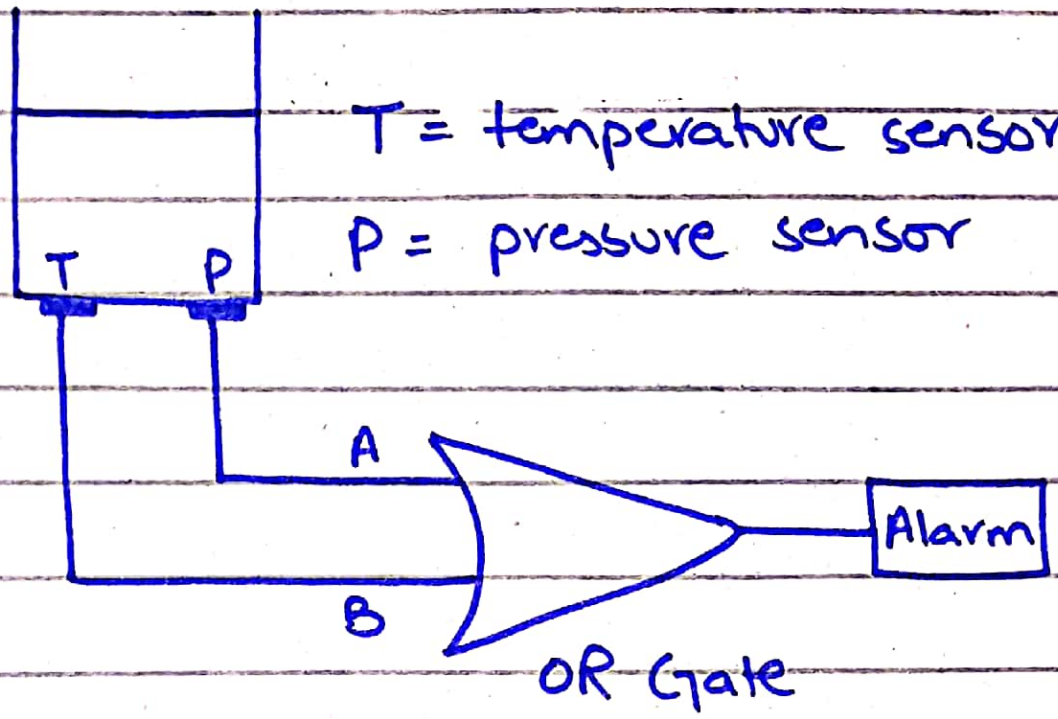


A	B	Ā	B̄	A+B̄	Ā+B	A+B̄ · Ā+B
0	0	1	1	1	1	1
0	1	1	0	0	1	0
1	0	0	1	1	0	0
1	1	0	0	1	1	1

→ Truth Table

Ans Q6

Diagram of a boiler :-



Truth table :

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1