Assignment 3

CSE251

fall 22

Name : Shihab Muhtasim

sec : 13

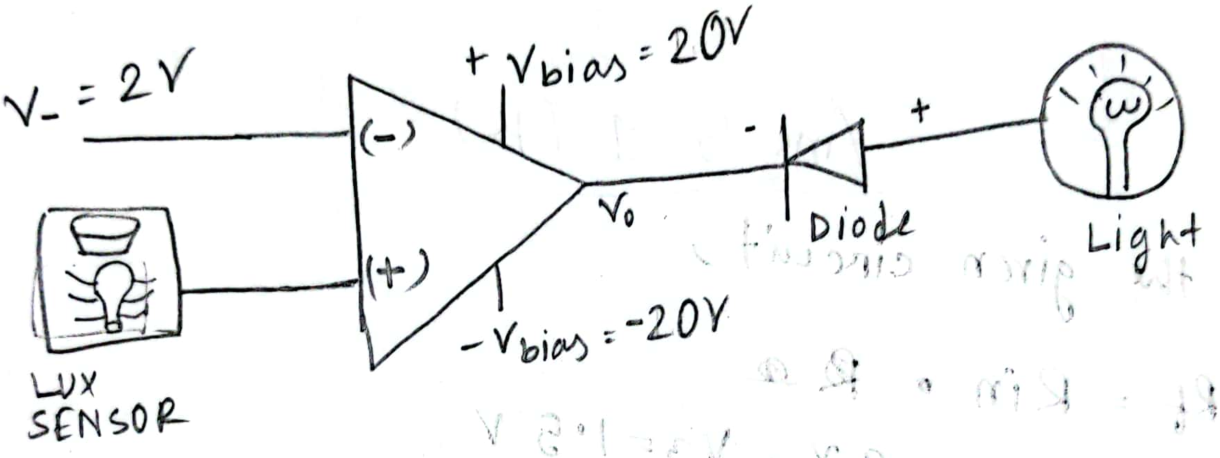
ID : 21301610

Ans to qr no 1

Given, V_{night}, 0 lux = 1 V.

V_{dusk}, 20 lux = 2 V

V_{dawn}, 80 lux = 3 V



At night, $V_+ = 1V$

$\therefore$ ~~Vo~~ = $A(V_+ - V_-) = A(1-2) = -A$

$\therefore V_o = -20V$; light required to be ON

At dusk, $V_+ = 2$,

Here, $V_+ < V_-$ as in dusk V_+ keeps decreasing from 2 V.

$\therefore V_o = -20V$; light required to be ON.

At dawn, $V_+ = 3V$

$A(V_+ - V_-) = A(3-2) = A$

$V_o = +20V$; light required to be OFF.

Since the diode is set in reverse bias, current will pass through when V_o is negative, making the cathode terminal voltage less than the anode and light will turn ON.

Ans to 1 (b)

In the given circuit,

~~Lastoo~~ $R_f = R_{in}$

$V_1 = 1V$, $V_2 = 2V$, $V_3 = 1.5\ V$

$$V_{out} = -\left(\frac{R_f}{R_{in}} V_1 + \frac{R_f}{R_{in}} V_2 + \frac{R_f}{R_{in}} V_3\right)$$

$$= -(V_1 + V_2 + V_3) = -(1 + 2 + 1.5)$$

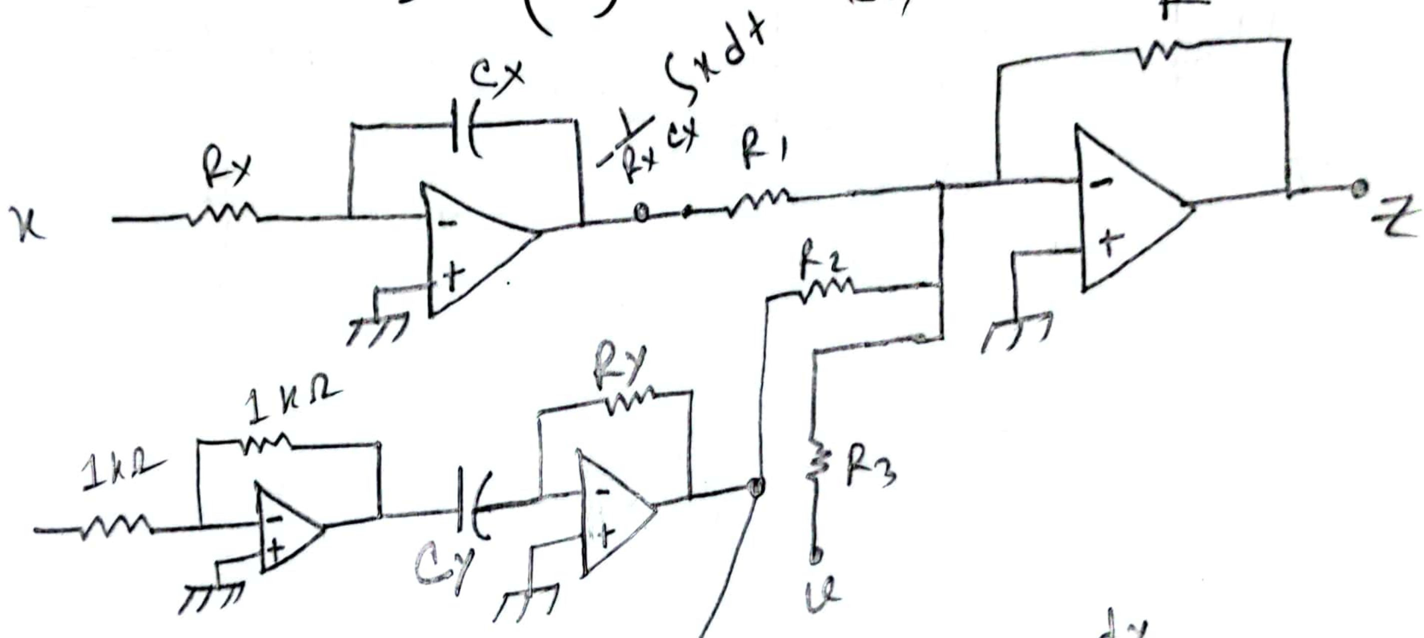
$$= -4.5$$

$\therefore V_{out} = -4.5\ V$

Ans to Q 1 (c)|i)

Expression, $z = \int x\,dt - 2\frac{dy}{dt} - u$

$= -\left(-\int x\,dt + 2\frac{dy}{dt}(-1) + u\right)$



$-R_y C_y \frac{d}{dt}(-y) = R_y C_y \frac{dy}{dt}$

Here, $\frac{-1}{R_x C_x} = -1$

Let, $C_x = 47\ \mu F$

$R_x = 21.2766\ k\Omega$

Again, $-R_y C_y = -1$

Let, $C_y = 47\ \mu F$

$R_y = 21.2766\ k\Omega$

Again,

$\frac{R}{R_1} = 1$, $\frac{R}{R_2} = 2$, $\frac{R}{R_3} = 1$

Let, $R = 10\ k\Omega$

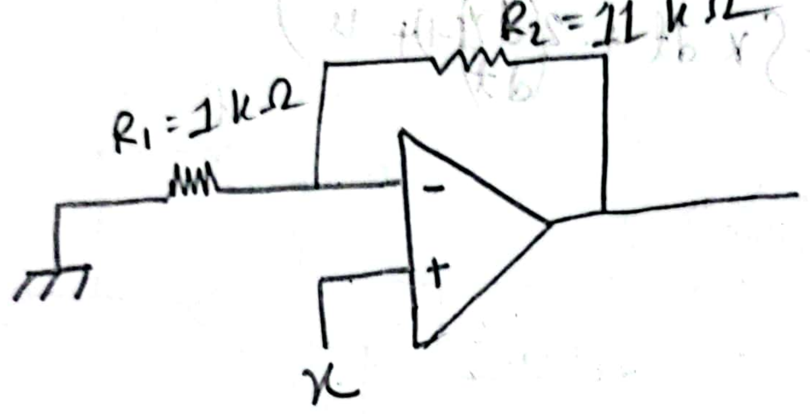
$R_1 = 10\ k\Omega$

$R_2 = 5\ k\Omega$

$R_3 = 10\ k\Omega$

Ans to Q 1 (c) (ii)

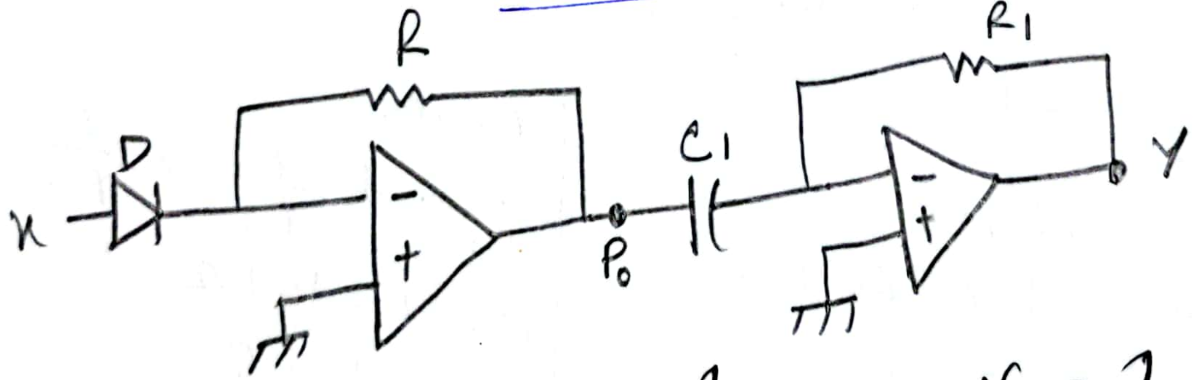
Expression, $y = 12x$



$$V_o = V_i\left(1 + \frac{R_2}{R_1}\right)$$
$$= x\left(1 + \frac{11}{1}\right)$$
$$= x(1+11)$$
$$= x(12)$$
$$= 12x$$

$\therefore y = 12x$

Ans to Q 1 (d)



Here, $I_s R = 1 \rightarrow R = \frac{1}{I_s}$; $V_T = 1$

$$P_o = -R\, I_s \exp\left(\frac{x}{\eta \cdot V_T}\right)$$

$$= -\frac{1}{I_s} \times I_s \times \exp\left(\frac{x}{\eta \cdot 1}\right)$$

$$= -\exp\left(\frac{x}{\eta}\right)$$

Again,

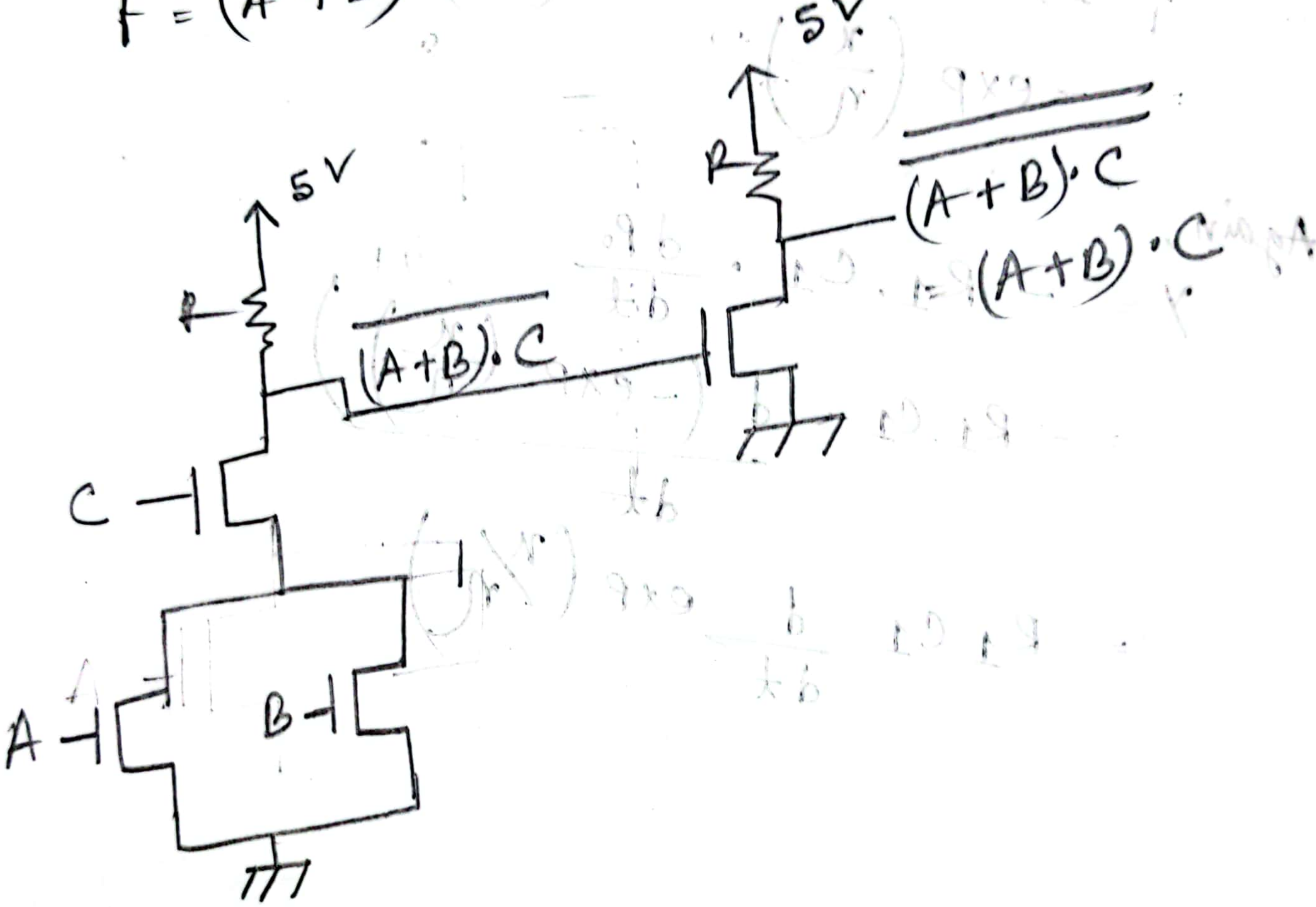
$$y = -R_1 \cdot C_1 \cdot \frac{dP_o}{dt}$$

$$= -R_1 \cdot C_1 \cdot \frac{d\left(-\exp\left(\frac{x}{\eta}\right)\right)}{dt}$$

$$= R_1 C_1 \frac{d}{dt} \exp(x/\eta)$$

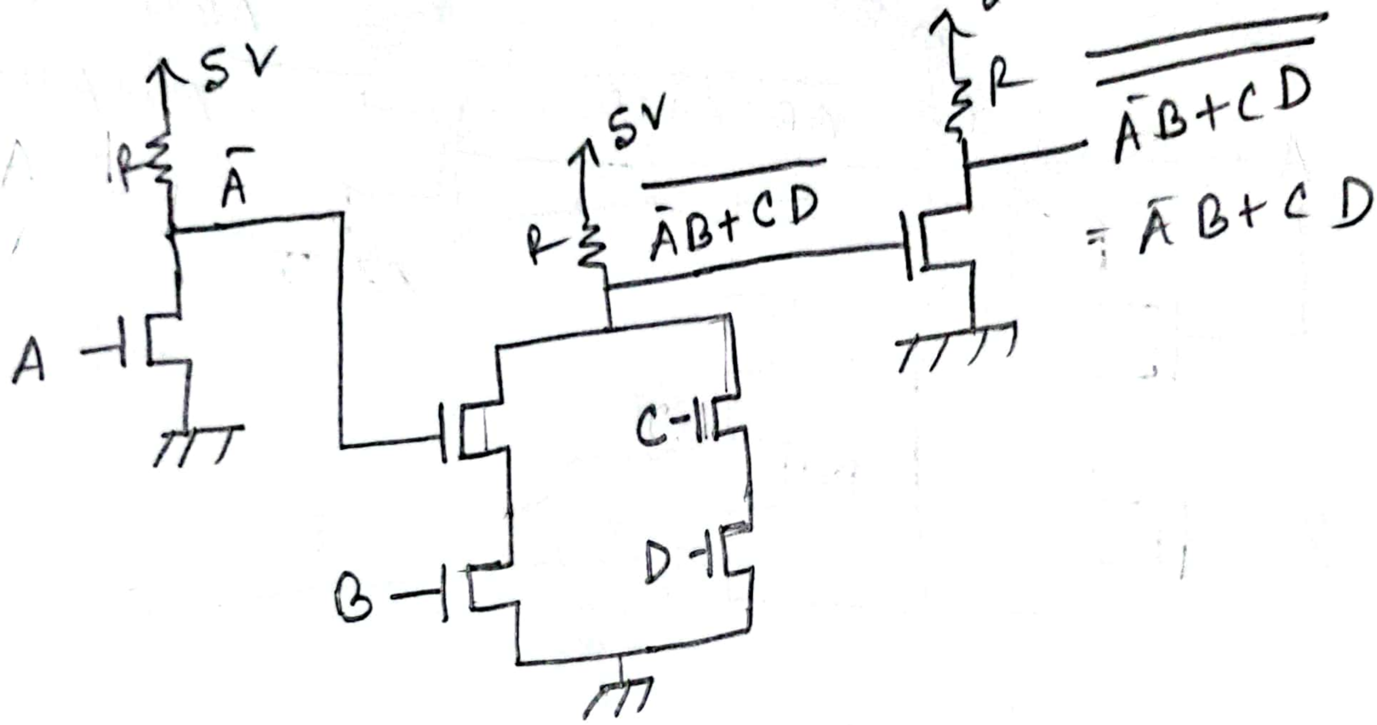
Ans to Q 2 (a)

$f = (A+B)C$



Ans to 2 (b)

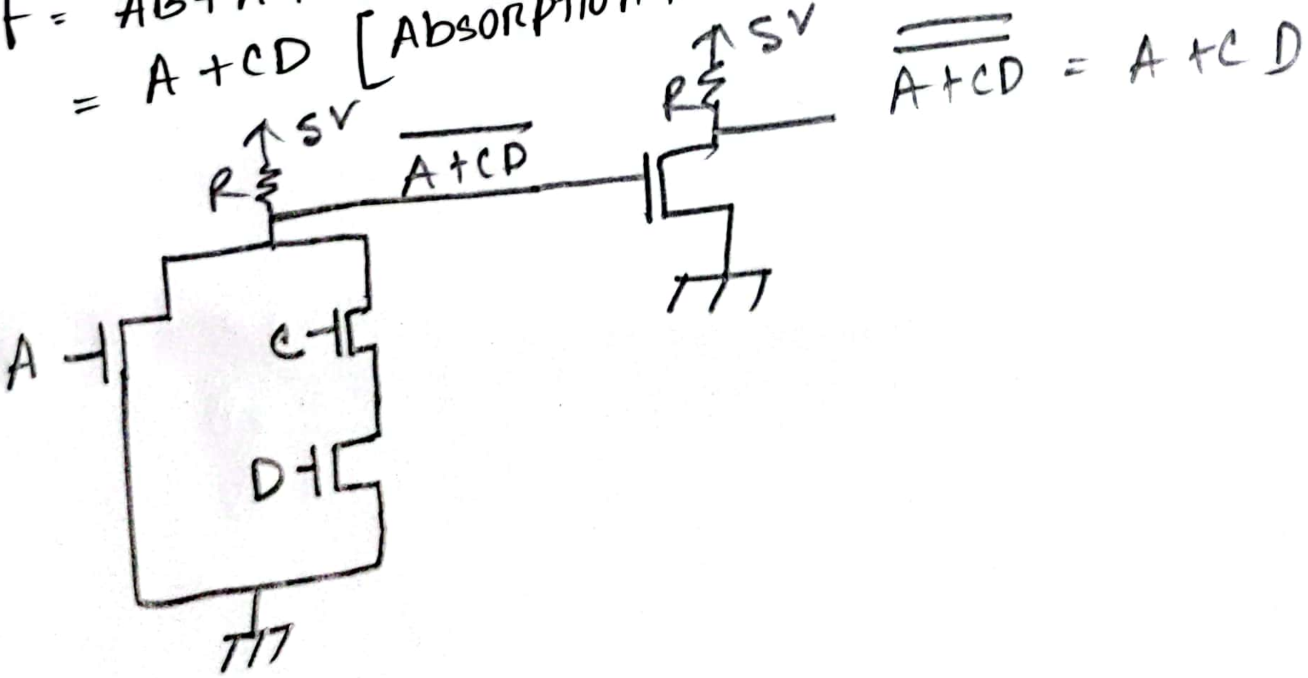
$f = (\bar{A}B + CD)$



Ans to 2 (c)

$f = AB + A + CD$

$= A + CD$ [Absorption law $\therefore AB + A = A$]



Without simplifying:

$f = AB + A + CD$