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## **AIUB COURSE SOLUTION**

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***COURSE NAME: Digital Logic and Circuits***

***CHAPTER: Final Term OBE Assignment Fall***

**2020-21**

**SOLVED BY**

**NAME: MD. SAMIN ANJUM**



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A car safety alarm has four input sensors – **door (D)**, **key in (K)**, **seat pressure (S)**, and **seat belt (B)**. Your job is to design the **alarm (A)** which will turn on and will sound for **XX** milli-seconds for the following conditions -

- The key is in, and the door is not closed, or
  - The door is closed, the key is in, the driver is in the seat, and the seat belt is not closed.
- i. Design the digital system which will trigger the alarm and implement the system with CMOS logic.

ii. Design the timer circuit which will activate the timer for **XX** milli-seconds.

**Direction:**

- The numbers **XX** are the last two digits of the middle part of your ID (12-345**XX**-2) (In case, the last two digits of your ID is less than 10, then add 10 with the number before using it to solve the problem.)
- Also, Assume capacitor  $C_1 = 10 \mu F$

**Solution:**

Answers to the Questions cNo. 01(0i)

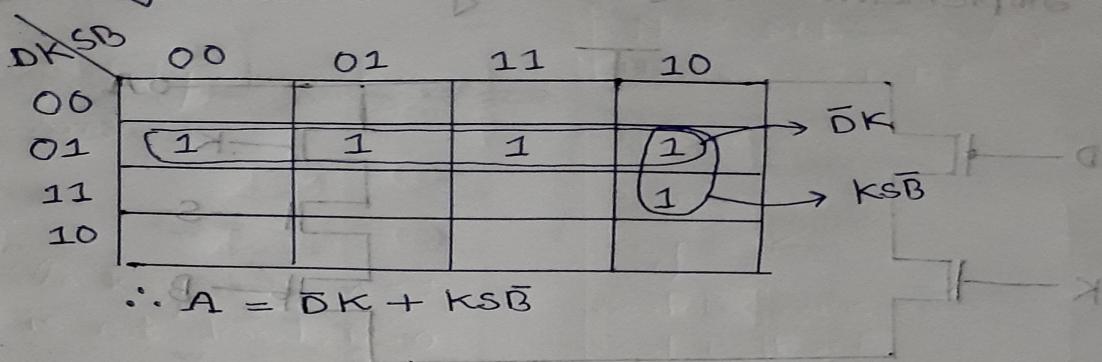
<p>* A car safety alarm has four sensors.</p> <p><u>Conditions:</u></p> <p><u>For (i) :</u> The key is in, <math>K=1</math> The door is not closed, <math>D=0</math></p> <p><u>For (ii) :</u> The door is closed, <math>D=1</math> The key is in, <math>K=1</math>. The driver is in the seat, <math>S=1</math>. The seat belt is not closed, <math>B=0</math>.</p>	<p>Name: Md. Samin Anjum ID: 19-39434-1</p> <p>Hence,</p> <p>Door = D Key = K Seat Pressure = S Seat Belt = B Alarm = A</p>
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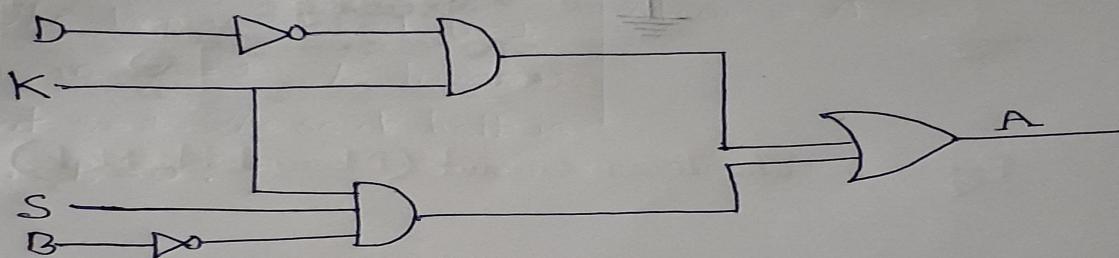
Truth Table

Input				Output
D	K <sub>SB</sub>	S	B	A
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

\* Karnaugh Map:

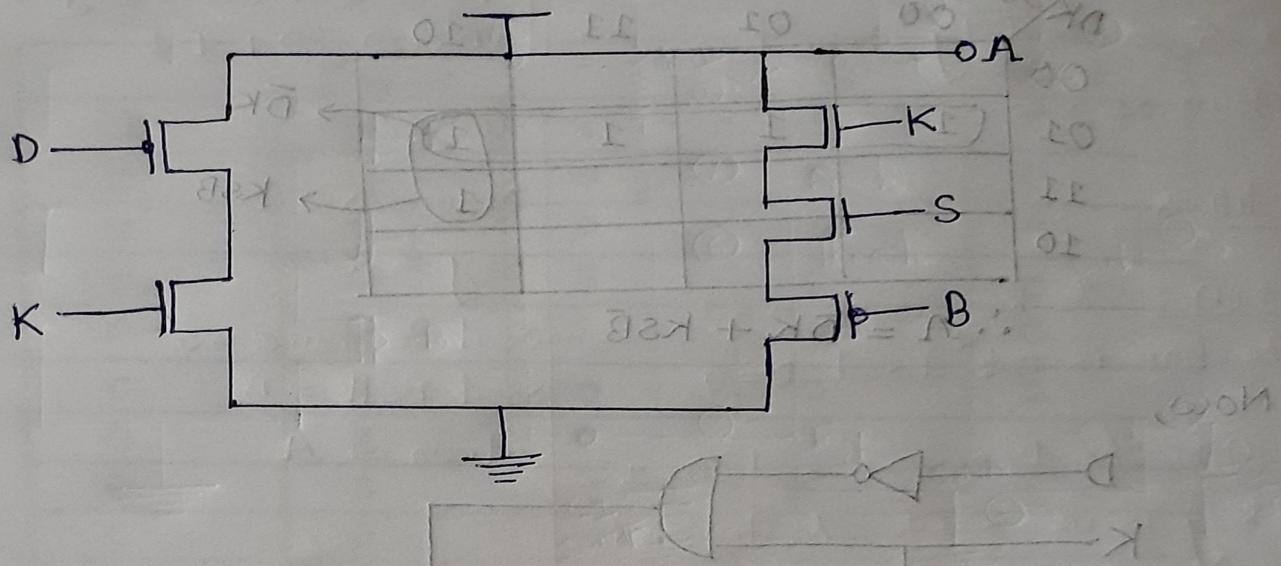


Now,



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\* Implementation of the system with CMOS Logic:



Answer to the Question No. 02(ii)

ID: 19 - 39434 - 1

We know,

The width of the pulse is for Monostable Mode.

For now,

$$T_W = 1.1 R_1 C_1$$

$$\begin{aligned} \Rightarrow R_1 &= \frac{T_W}{1.1 C_1} \\ &= \frac{34 \times 10^{-3}}{1.1 \times 10 \times 10^{-6}} \\ &= 3.09 \times 10^3 \Omega \end{aligned}$$

$$\therefore R_1 = 3.09 \text{ k}\Omega$$

Hence,

$$XX \text{ ms} = 34 \text{ ms}$$

$$\therefore T_W = 34 \text{ ms}$$

$$C_1 = 10 \mu\text{F}$$

(Show all the steps) towards obtaining the required output

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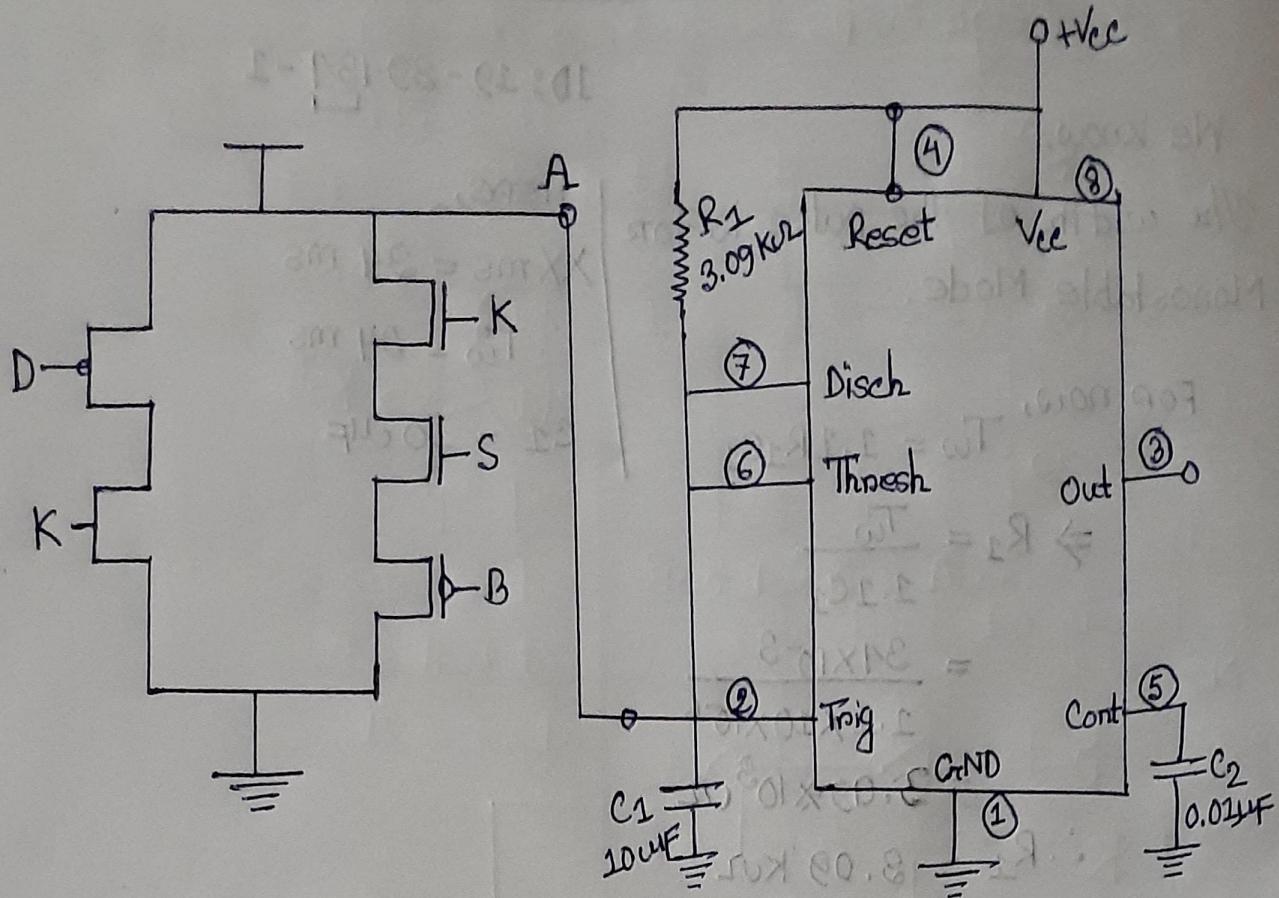


Figure : The timer circuit (Monostable Mode)