i) Truth ~~tatat~~ table :—

Emon Singha
20-92399-1
(O)

A	B	C	D	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

①

K-map :-

Group 1

AB\CD	00	01	11	10
00	1	1	1	1
01	1	1	1	0
11	0	0	0	1
10	1	1	1	1

→ Group 2

Group 3

Group -1

A B C D
0 0 0 0
0 0 0 1
0 0 1 1
0 0 1 0
0 1 0 0
0 1 0 1
0 1 1 1
0 1 1 0
———————
$\overline{A}$

Group -2

A B C D
~~0 0 0 0~~
0 0 1 0
0 1 1 0
1 1 1 0
1 0 1 0
———————
$C\overline{D}$

Group -3

A B C D
0 0 0 0
0 0 0 1
0 0 1 1
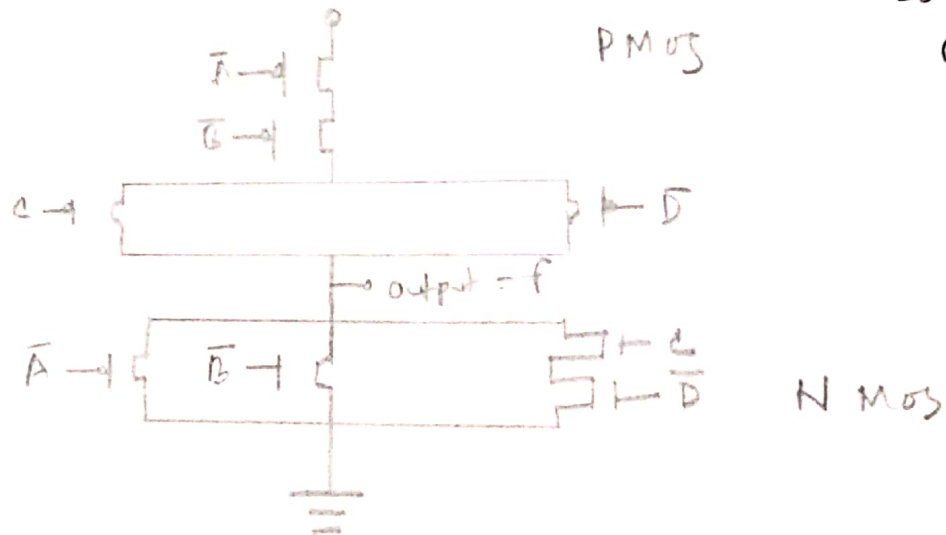0 0 1 0
1 0 0 0
1 0 0 1
1 0 1 1
1 0 1 0
———————
$\overline{B}$

$$f = \overline{A} + \overline{B} + C\overline{D}$$

Ans:-

②

Emon Singha
20-42344-1
(0)

c mos :-

$\overline{A}$ —◁ [
$\overline{B}$ —◁ [

PMOS

c → [   ] ◁— $\overline{D}$

output = f

$\overline{A}$ —◁ [$\overline{B}$ ⊣ [

—◁ c
⊣ $\overline{D}$

N MOS

$$f = \overline{\overline{A} + \overline{B} + c\overline{D}}$$

ii)

Given,

Eman Singh
20-42344-1
(O)

$$P = N + O + I + S + E$$

$ID = 20-42344-1$

Here, $N = 4, O = 2, I = 3, S = 4, E = 4$

Now,

$P = 4 + 2 + 3 + 4 + 4$

$= 17$

$Q = 100 - P$

$= 100 - 17$

$= 83\%$

$f = P5 = 17 \times 5 = 85 \, Hz$

Here, $85 \, Hz < 250 \, Hz$ which will be considered to be disturbingly low pitched. So, $f = 400 \, Hz$

Time period, $T = \dfrac{1}{f} = \dfrac{1}{400 \, Hz} = 0.0025 \, s$

High time $T_H = 0.83 \times 0.0025$

$= 0.0020755 \, s$

$= 2.08 \, ms$

Low time, $T_L = 0.17 \times 0.0025$

$= 0.000425$

$= 0.43 \, ms$

④

Here,

Emon Singha
20-42399-1
(O)

$$C = 50 \mu f$$
$$= 50 \times 10^{-6} \, f$$

We know,

$$T_L = 0.693 \, R_2 \, C$$

$$R_2 = \frac{T_L}{0.693 \times C}$$

$$= \frac{4.25 \times 10^{-4}}{0.693 \times 50 \times 10^{-6}}$$

$$= 12.27 \, \Omega$$

$$T_H = 0.693 \times (R_1 + R_2) \times C$$

$$R_1 + R_2 = \frac{T_H}{0.693 \times C}$$

$$R_1 = \frac{T_H}{0.693 \times C} - R_2$$

$$= \frac{2.08 \times 10^{-3}}{0.693 \times 50 \times 10^{-6}} - 12.27$$

$$= 47.76 \, \Omega$$

⑤

fig: Astable mode

Emon Singha

20-92399-1

(0)

47.76 Ω R_1

12.27 Ω R_2

Reset V_{cc}

Out

Threshold
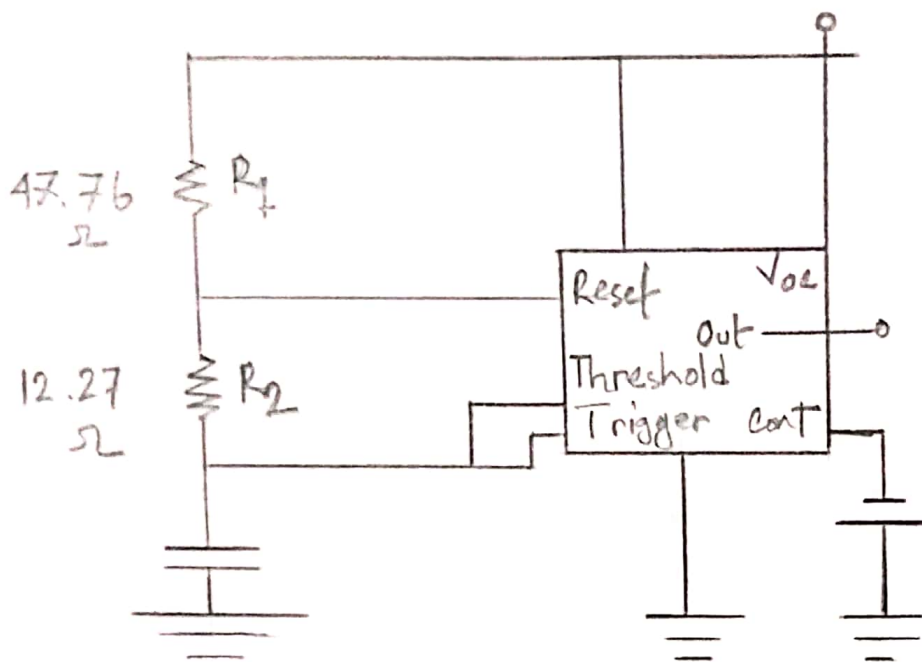
Trigger   Cont
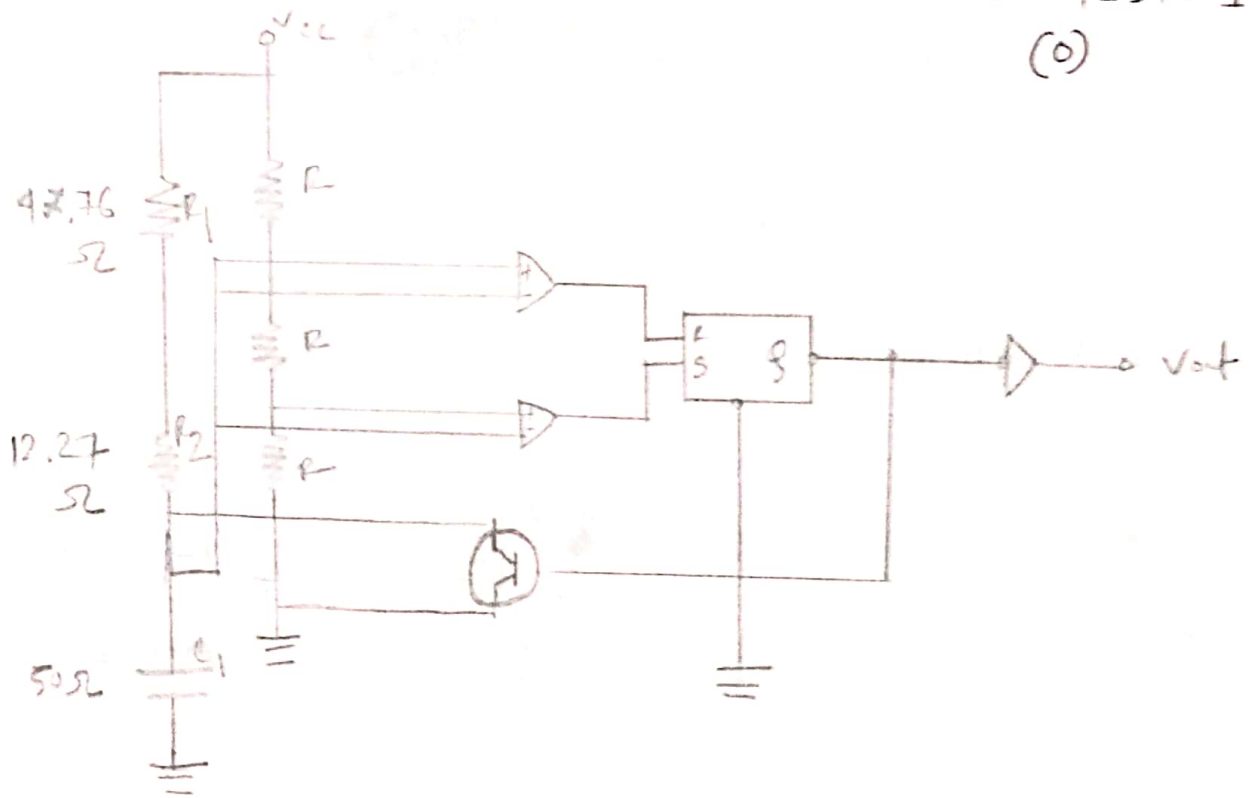
Fig :- Design of alarm timer circuit

⑦

iii)

Limitations of this developed system :- The developed system is Astable 555 timer. The output of the timer will be pulsting square wave with a time delay of 2.5ms. the sound will abilable for 83% of the duty cycle and will be inaudioable for next 17% of the duty cycle. A continuous sound would be heard if the duty cycle more than 83%..

Effect of increasing ~~due f~~ the frequency ~~abooen~~ above 4500Hz :-

Sound ~~abooe~~ above 4500 Hz may create high pitched waves. which ~~oo~~ may causes high frequency hearing loss to the consumer of the product. High frequency sound wave may affect hear like structures inside human ear.

High frequency hearing loss may have trouble to understadiy the difference between female and child voice. They cannot hear high pitched letter such as f, H, s. Thats why they might also ~~str~~ struggle to understand normal voice.

Eman Singha
20-9e399-1
(0)

⑧