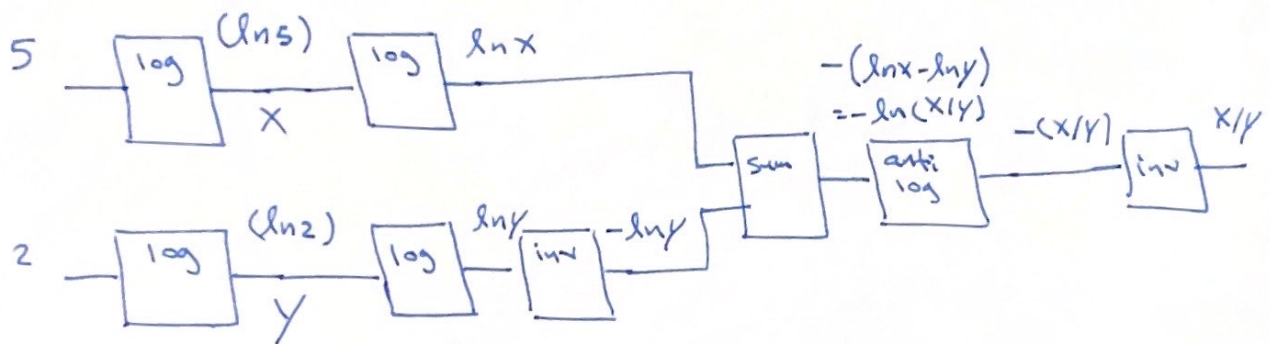


Q₃ Design the analog computer of the $\log_2 5$

ans $\log_2 5 = \frac{\ln 5}{\ln 2} = \frac{x}{y}$

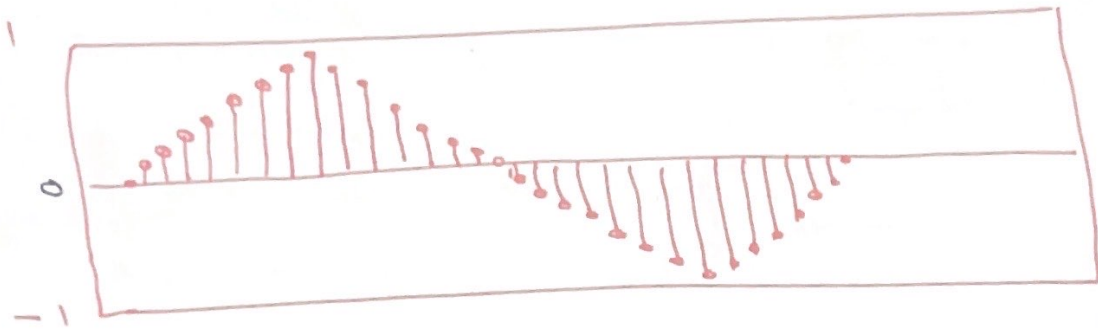


analog computer

File 1 Jot

①

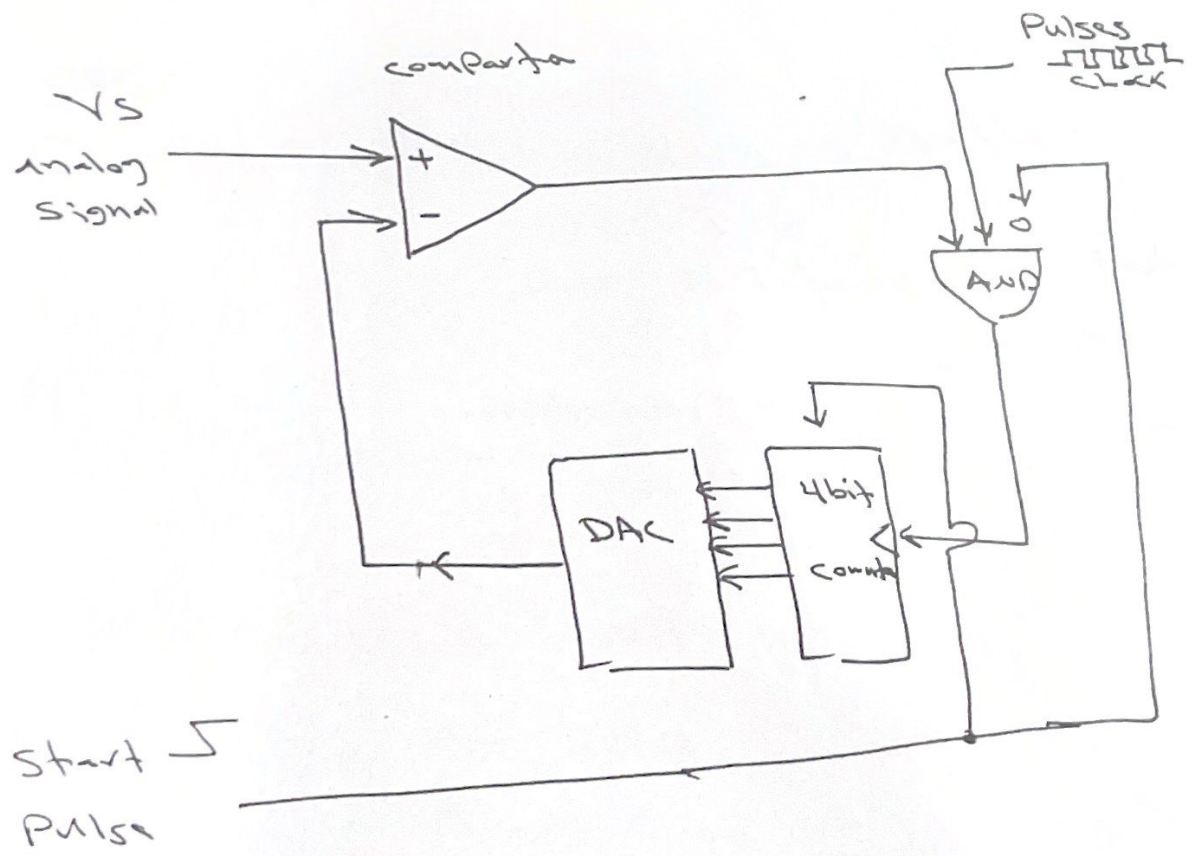
Q₂ Design a digital ramp ADC for follow signal

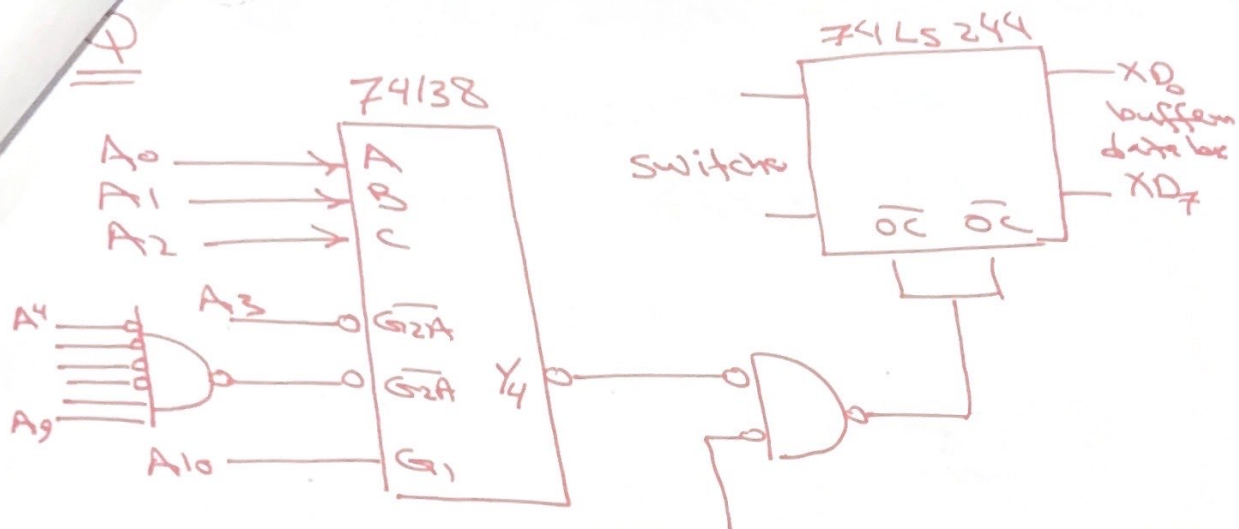


ans $\therefore$ 16 level

$\therefore$ no. of level $= 2^n = 16 \quad \therefore 2^4$

$\therefore$ 4 bit





- ① Determine is the port output or input? how?
- ② Find Port address?
- ③ Write a program instruction for interfacing CPU with the port

ans

- ① input port use 74LS244 Buffer
use $\overline{IOR}$
use switches are input

②

A ₁₀	A ₉	A ₈	A ₇	A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀
1	1	1	0	0	0	0	0	0	1	0
7			0				4			

∴ Port Address is 704H

- ③
- ```

MOV DX, 704H
IN AL, DX

```

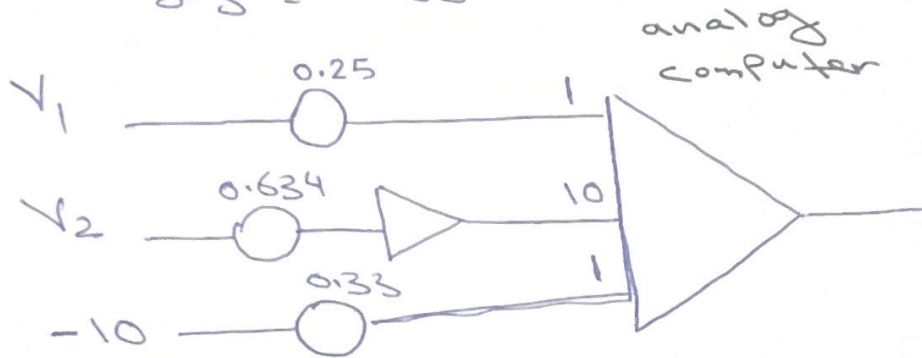
Determine the analog diagram and circuit to implement the

$$V_o = -0.25V_1 + 6.34V_2 + 3.3$$

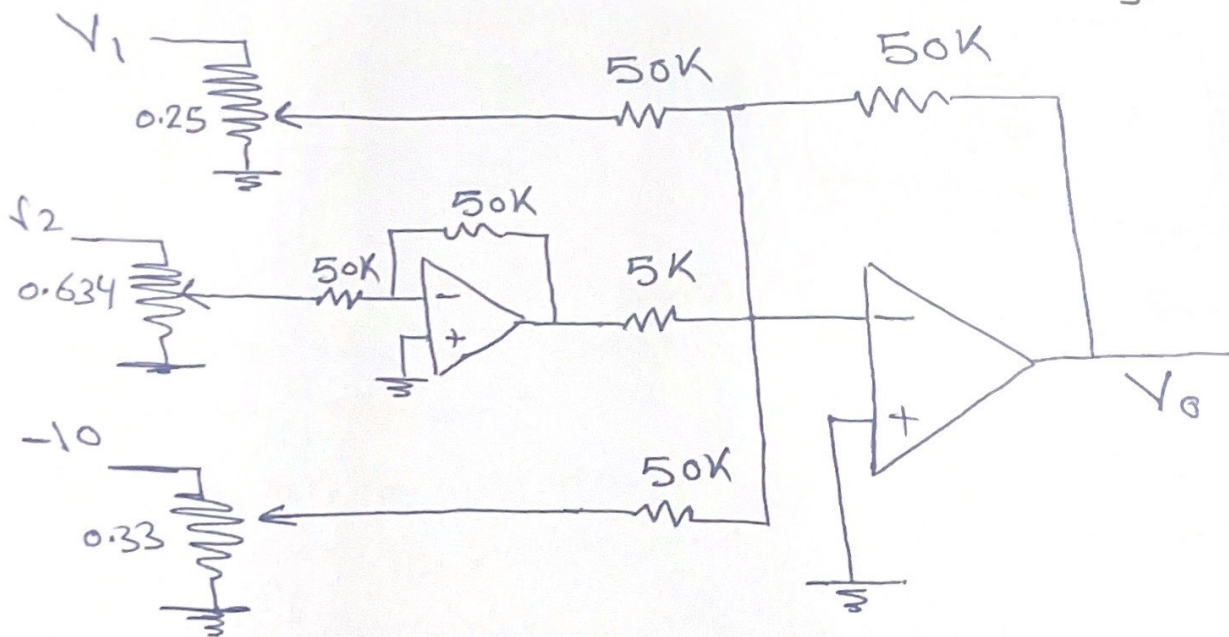
ans

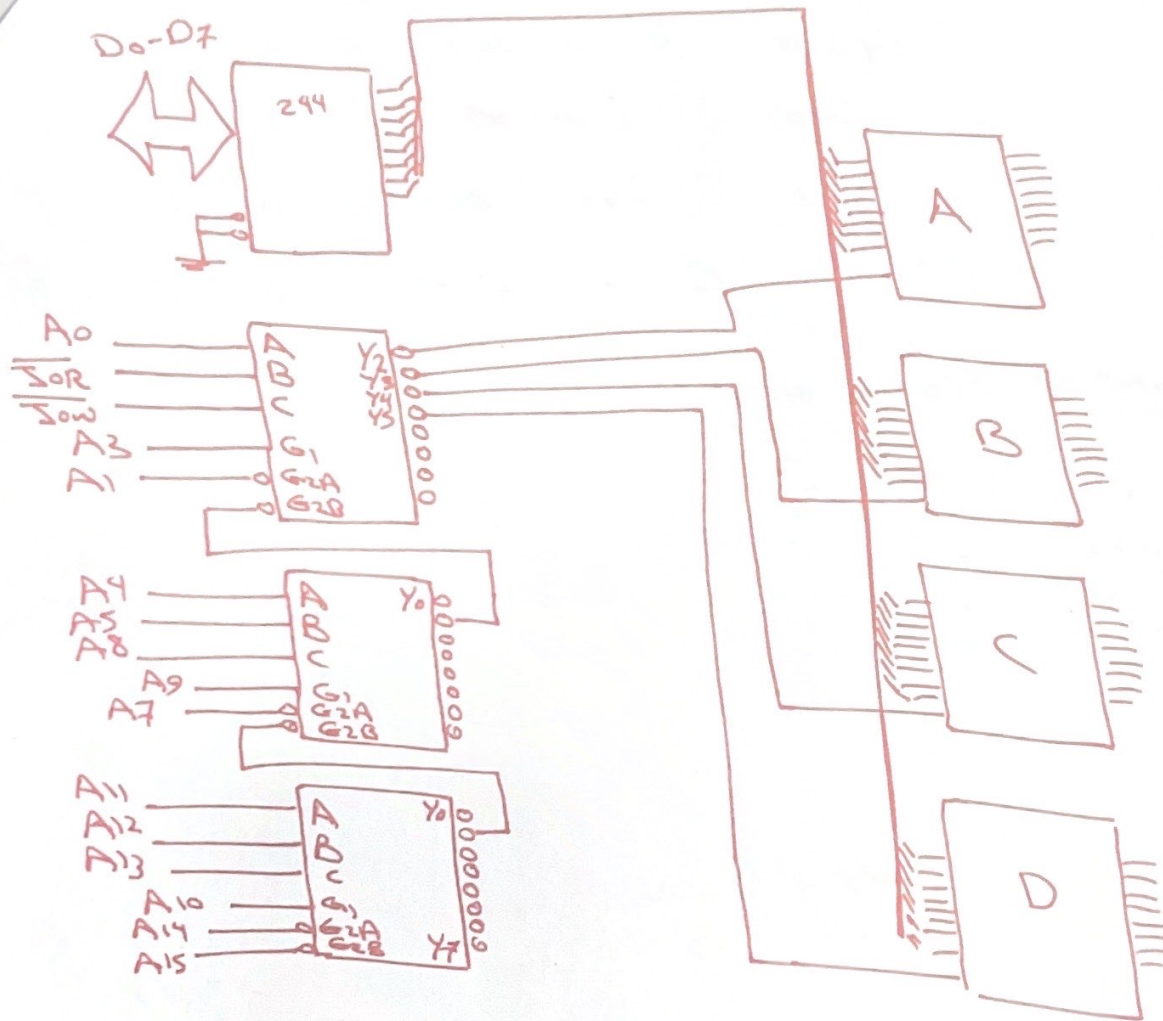
$$6.34 = 0.634 \times 10$$

$$3.3 = 0.33 \times 10$$



circuit diagram





- 1- find the Port addresses
- 2- Determine the INPUT and OUTPUT Port with reason?
- 3- by using system in the figure design security system then write required instruction.

|                | Y <sub>1</sub> | Y <sub>0</sub> | Y <sub>2</sub> | Y <sub>3</sub> | Y <sub>4</sub> | Y <sub>5</sub> |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 140A5A4        | 0              | 0              | 0              | 1              |                |                |
| A13A12A11      | 0              | 0              | 0              | 1              |                |                |
| Y <sub>2</sub> | 0              | 1              | 0              |                |                |                |
| Y <sub>3</sub> | 0              | 1              | 1              |                |                |                |
| Y <sub>4</sub> | 1              | 0              | 0              |                |                |                |
| Y <sub>5</sub> | 1              | 0              | 1              |                |                |                |

|             | A <sub>15</sub> A <sub>14</sub> | A <sub>13</sub> A <sub>12</sub> | A <sub>11</sub> A <sub>10</sub> A <sub>9</sub> A <sub>8</sub> | A <sub>7</sub> A <sub>6</sub> A <sub>5</sub> A <sub>4</sub> | A <sub>3</sub> A <sub>2</sub> A <sub>1</sub> A <sub>0</sub> |
|-------------|---------------------------------|---------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| PortA 0E18H | 0 0 0 0                         | 1 1 1 0                         | 0 x 0 1                                                       | 1 x 0 0                                                     |                                                             |
| PortB 0E19H | 0 0 0 0                         | 1 1 1 0                         | 0 x 0 1                                                       | 1 x 0 1                                                     |                                                             |
| PortC 0E18H | 0 0 0 0                         | 1 1 1 0                         | 0 x 0 1                                                       | 1 x 0 0                                                     |                                                             |
| PortD 0E19H | 0 0 0 0                         | 1 1 1 0                         | 0 x 0 1                                                       | 1 x 0 1                                                     |                                                             |

if x=0

② Port A, B are output port  
Port D, C are input port

③ if car with four door "for sensor" input  
∴ input to Port D

alarm "horn" or LED output  
use Port A to horn

```

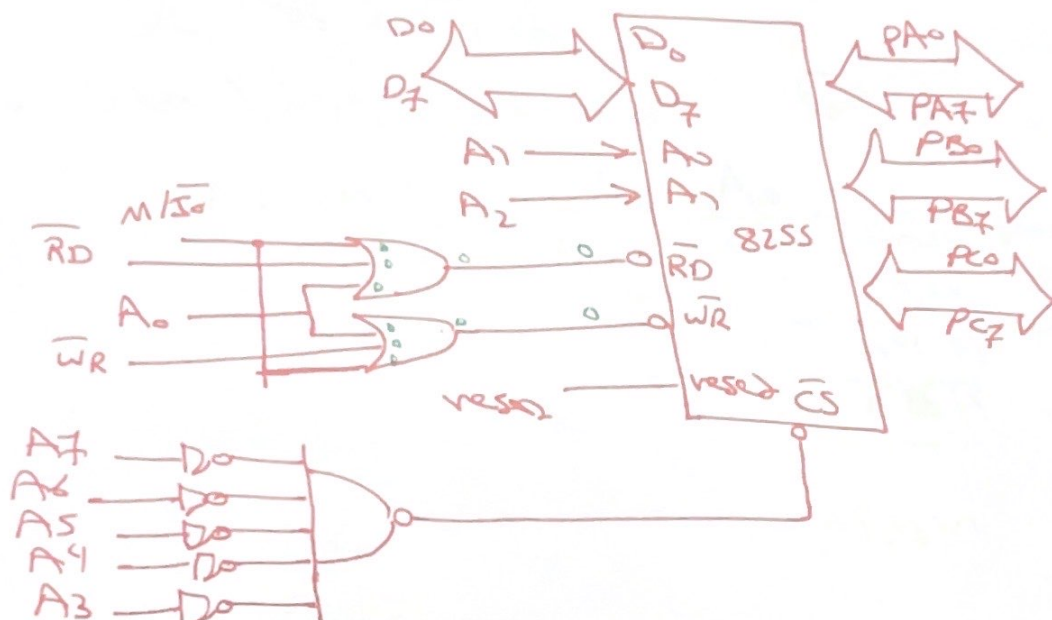
start: mov DX, 0E19H
check: in AL, DX
 and AL, 0FH
 jz check
 mov DX, 0E18H
 mov AL, FFH
 out DX, AL
 jmp start

```

AL = xxxx xxxx <sup>Sensor</sup>  
      0000 1111

Find The Port address in figure

6



ans =  $A_0 = 0$   
 $A_7 A_6 A_5 A_4 A_3 = 00000$

|              |     | $A_7 A_6 A_5 A_4$ | $A_3 A_2 A_1 A_0$ |
|--------------|-----|-------------------|-------------------|
| Port A       | 00H | 0000              | 0000              |
| Port B       | 02H | 0000              | 0010              |
| Port C       | 04H | 0000              | 0100              |
| Control word | 06H | 0000              | 0110              |

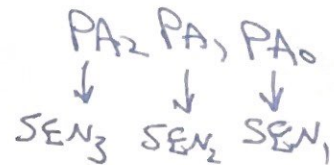
A.W

⑦

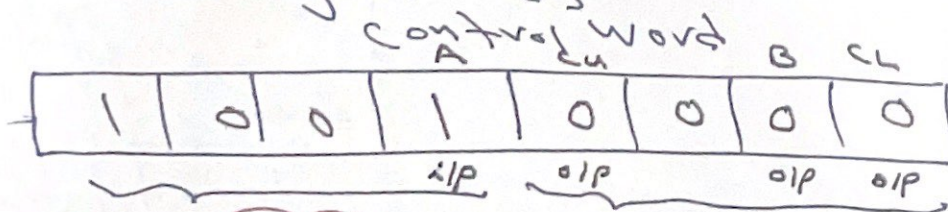
- Use 2255
- Starting address 60H

| A <sub>7</sub> A <sub>6</sub> A <sub>5</sub> A <sub>4</sub> | A <sub>3</sub> A <sub>2</sub> A <sub>1</sub> A <sub>0</sub> |     |         |
|-------------------------------------------------------------|-------------------------------------------------------------|-----|---------|
| 0 1 1 0                                                     | 0 0 0 0                                                     | 60H | Port A  |
| 0 1 1 0                                                     | 0 0 1 0                                                     | 62H | Port B  |
| 0 1 1 0                                                     | 0 1 0 0                                                     | 64H | Port C  |
| 0 1 1 0                                                     | 0 1 1 0                                                     | 66H | control |

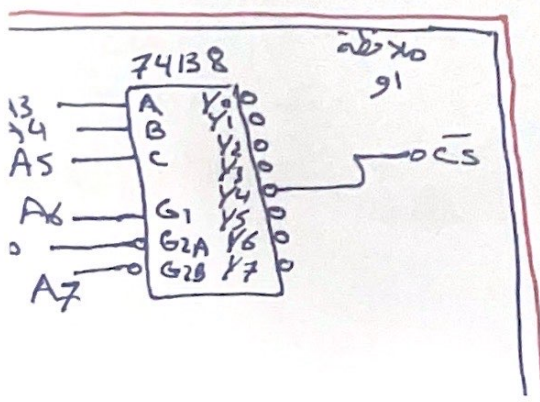
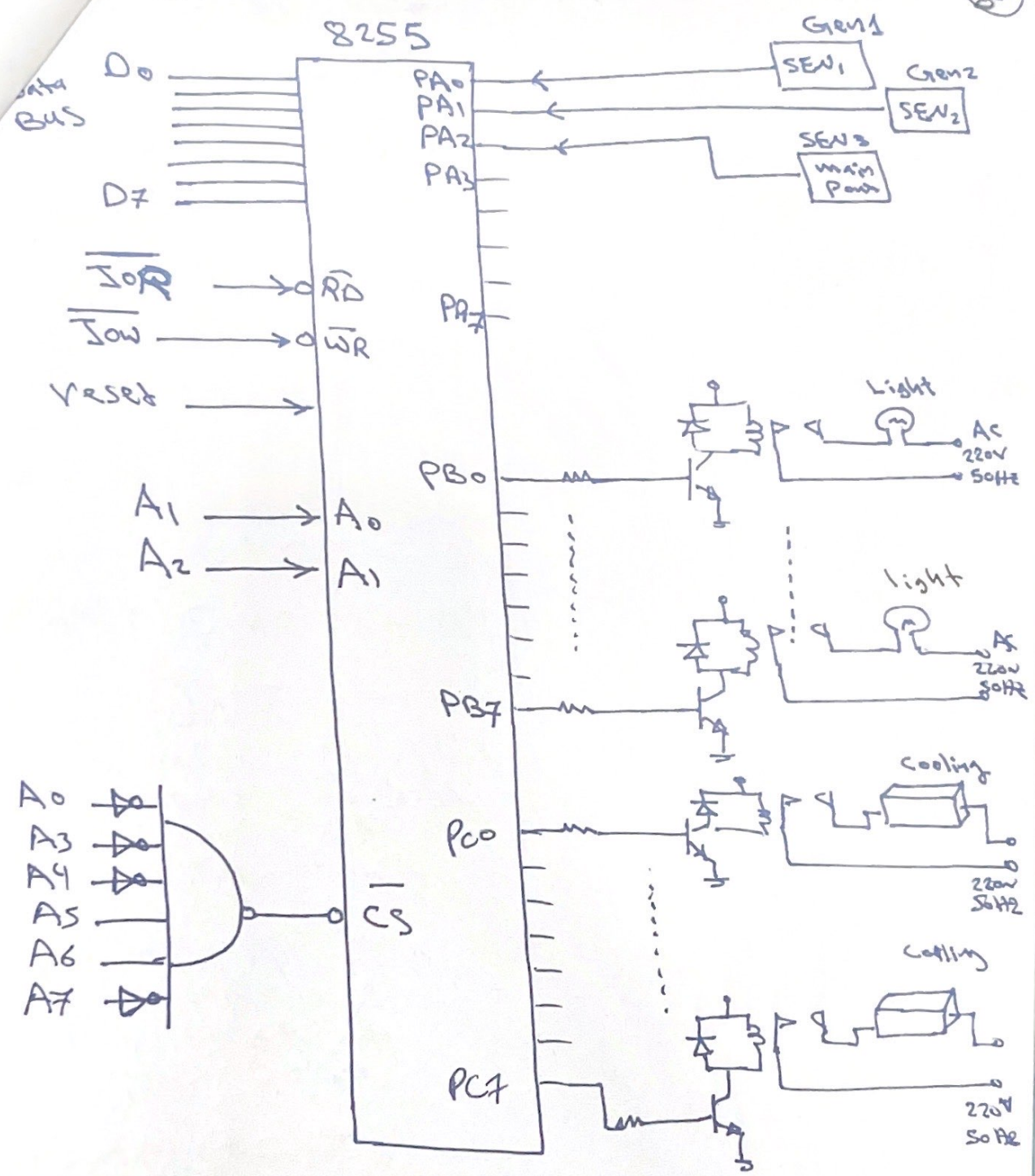
- we have three sensor  
 SEN<sub>1</sub> from GEN<sub>1</sub>  
 SEN<sub>2</sub> from GEN<sub>2</sub>  
 SEN<sub>3</sub> from Power  
 connected to Port A



- Use Port B to ~~on~~ turn on lighting loads
- Use Port C to turn on cooling loads



60H



MOV AL, 90H

OUT 66H, AL

main: IN AL, 60H

~~CMP~~ ~~AL~~ AL, 01H

JZ \*

# : CMP AL, 02H

JZ \*\*

## : CMP AL, 03H

JZ \*

\* : CMP AL, 04H

JNZ main

MOV AL, FFH

OUT 62H, AL

OUT 64H, AL

JMP main

\* : MOV AL, FFH

OUT 62H, AL

OUT 64H, AL

JMP \*

\* : MOV AL, FFH

OUT 62H, AL

JMP #

\*\* : MOV AL, FFH

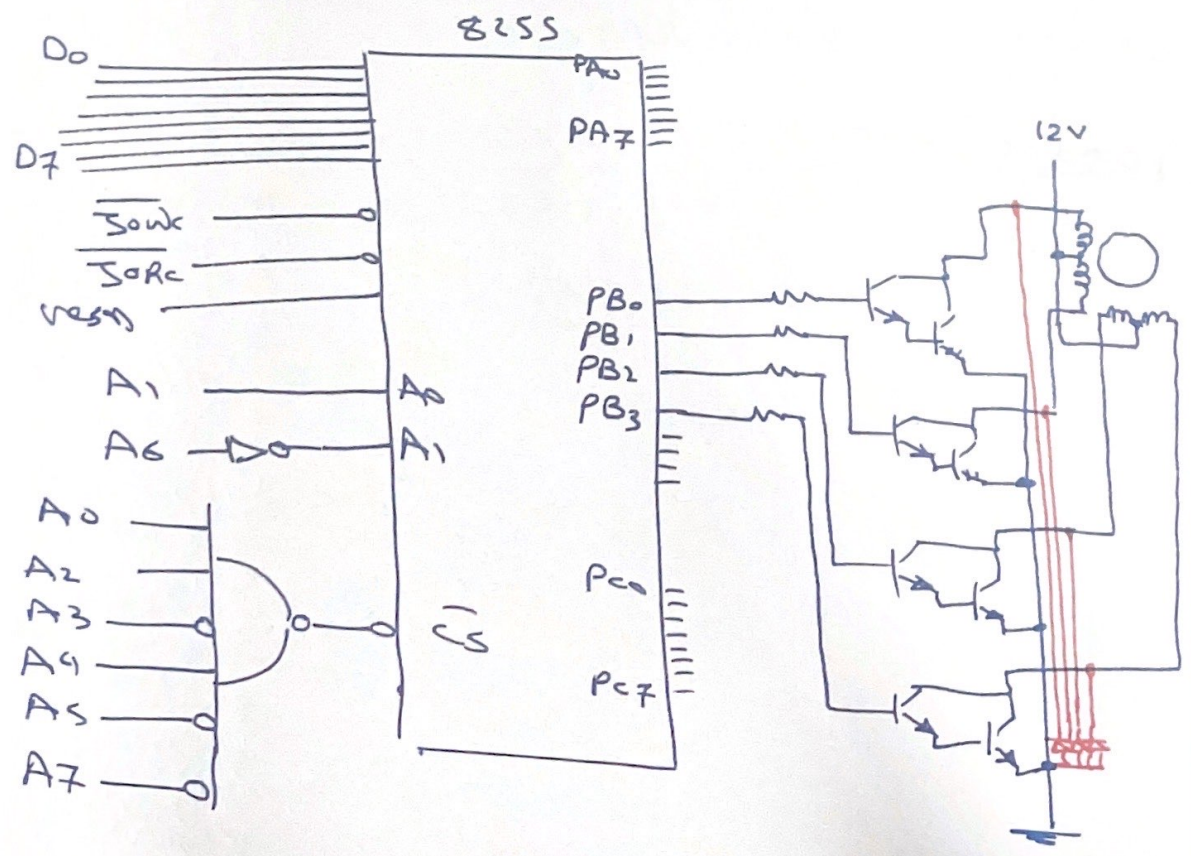
OUT 62H, AL

JMP ##

Design Stepper motor controller  
 by using Port B of 8255 PPS  
 when Port B (57H) and Port C (15H).  
 then write the required instruction  
 for rotate the motor (90°) clockwise  
 (NT=100, motor speed 15 RPM,  
 CPU frequency = 1 MHz.

ans

|             | A <sub>7</sub> | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |
|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Port A 55H  | 0              | 1              | 0              | 1              | 0              | 1              | 0              | 1              |
| Port B 57H  | 0              | 1              | 0              | 1              | 0              | 1              | 1              | 1              |
| Port C 15H  | 0              | 0              | 0              | 1              | 0              | 1              | 0              | 1              |
| Control 17H | 0              | 0              | 0              | 1              | 0              | 1              | 1              | 1              |



no. of teeth  $N_T = 100$   
motor speed is RPM

$$\therefore \frac{15}{60} = \frac{1}{4} \frac{\text{rotation}}{\text{Sec}}$$

$\therefore$  4 second for one rotation

CPU freq = 1 MHz

$$\text{clock period: } \frac{1}{f} = \frac{1}{1M} = 1 \mu\text{sec}$$

$\therefore$  loop instruction need 17 clock

$$\therefore 17 * 1\mu = 17 \mu\text{sec}$$

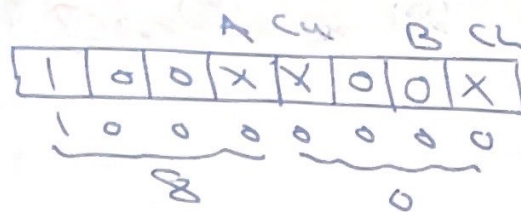
$$\frac{4 \text{ sec}}{100 \text{ teeth}} = 0.04 \text{ second for each teeth}$$
$$= 40 \text{ msec}$$

$$\therefore \frac{40 \text{ msec}}{17 \mu} = \frac{40 \times 10^{-3}}{17 \times 10^{-6}} = \frac{40000}{17} = 2352.94$$
$$\approx \underline{\underline{2353}}$$

$\therefore$  only  $90^\circ$

$$\frac{360^\circ}{100} = 3.6^\circ$$

$$\therefore \frac{90^\circ}{3.6^\circ} = \underline{\underline{25}}$$



2

```

PORTB EQU 57H
CNTR EQU 17H
MOV AL, 80H
MOV DX, CNTR
OUT DX, AL
MOV BL, 25
MOV AL, 33H
MOV DX, PORTB
back: OUT DX, AL
 ROR AL, 1
 MOV CX, 2353
self: loop self
 DEC BL
 JNZ back
 HLT

```

Program PPT  
PortB output

او ای، قیچی 66H، 66H  
CCH، 1

Delay for  
40 msec

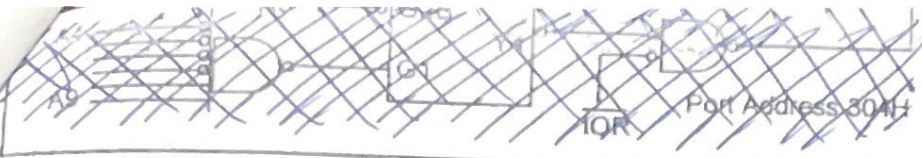
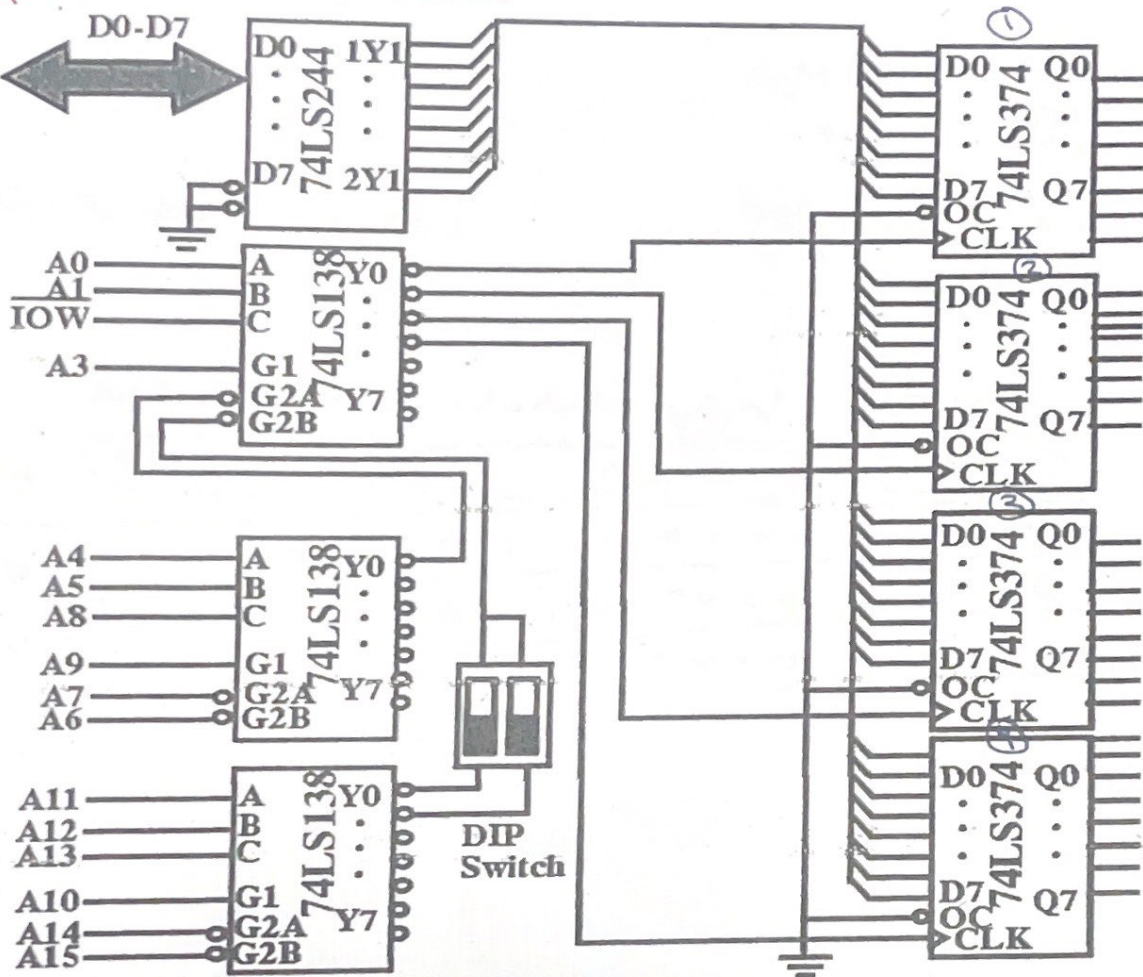


Figure 11-9. Using 74LS138 for I/O Address Decoder

*Q find the port address*



74LS374 no. 1

$Y_0 = 000$

$A_3 = 1$

$G_2A \Rightarrow Y_0 = 000$

$G_2B \Rightarrow Y_0 = 000$

$\overline{Y_{00}} A_1 A_0$   
0 0 0

$A_6 A_5 A_4$   
0 0 0

$A_{13} A_{12} A_{11}$   
0 0 0

$A_9 = 1$   
 $A_7 = 0$   
 $A_6 = 0$

$A_{10} = 1$   
 $A_{14} = 0$   
 $A_{15} = 0$

|      | $A_{15} A_{14} A_{13} A_{12}$ | $A_{11} A_{10} A_9 A_8$ | $A_7 A_6 A_5 A_4$ | $A_3 A_2 A_1 A_0$ |
|------|-------------------------------|-------------------------|-------------------|-------------------|
| 508H | 0 0 0 0                       | 0 1 1 0                 | 0 0 0 0           | 1 0 0 0           |
| 609H | 0 0 0 0                       | 0 1 1 0                 | 0 0 0 0           | 1 0 0 1           |
| 50AH | 0 0 0 0                       | 0 1 1 0                 | 0 0 0 0           | 1 0 0 0           |
| 60BH | 0 0 0 0                       | 0 1 1 0                 | 0 0 0 0           | 1 0 1 1           |

عدم وجود  $A_2$  باینری

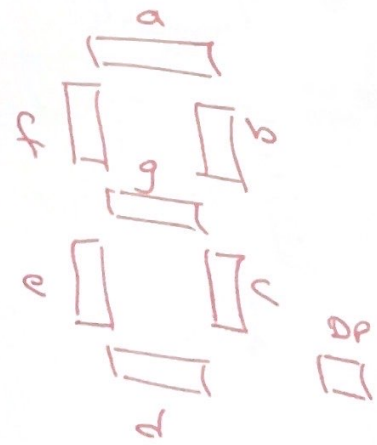


### Seven Segment

Common Cathode

1 → on  
0 → off

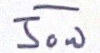
|   | G | F | E | D | C | B | A |    |
|---|---|---|---|---|---|---|---|----|
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 3F |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 06 |
| 2 |   |   |   |   |   |   |   |    |
| 3 |   |   |   |   |   |   |   |    |
| 4 |   |   |   |   |   |   |   |    |
| 5 |   |   |   |   |   |   |   |    |
| 6 |   |   |   |   |   |   |   |    |
| 7 |   |   |   |   |   |   |   |    |
| 8 |   |   |   |   |   |   |   |    |
| 9 |   |   |   |   |   |   |   |    |



✱

ans

to decaden

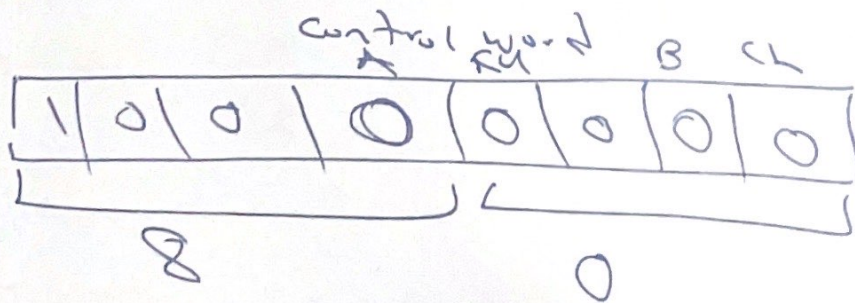
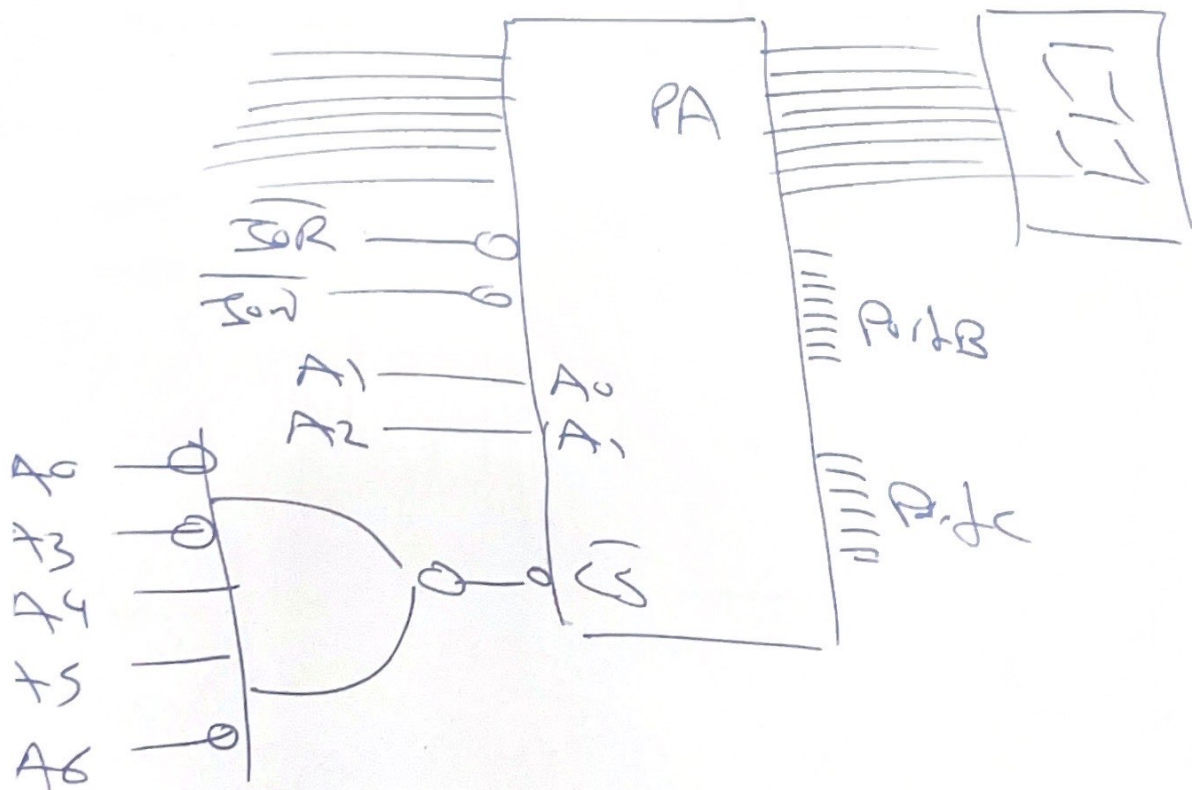


\* ~~More~~

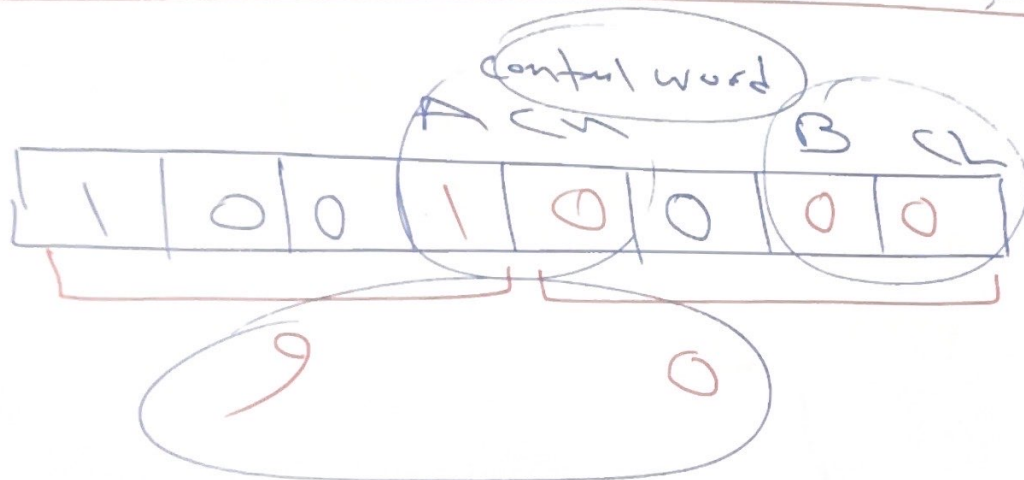
$\begin{array}{r}
 \text{XXXX XXXX} \\
 \text{000 0000} \\
 \hline
 \text{0000 000X} \\
 \text{2000 2000} \\
 \text{0000 0001}
 \end{array}$ 
 $\begin{array}{l}
 Z_f = 1 \\
 Z_{f0}
 \end{array}$

8255

|      |    | A7654 | 3 | 2 | 1 | 0 |
|------|----|-------|---|---|---|---|
| PA   | 70 | 0     | 1 | 1 | 1 | 0 |
| PB   | 72 | 0     | 1 | 1 | 1 | 0 |
| PC   | 74 | 0     | 1 | 1 | 1 | 0 |
| Conf | 76 | 0     | 1 | 1 | 1 | 0 |



|         |      |      |        |        |
|---------|------|------|--------|--------|
| Port A  | 310H | 98   | 7654   | 3210   |
|         |      | (11) | (0001) | (0000) |
| Port B  | 311H | (11) | (0001) | (0001) |
| Port C  | 312H | (11) | (0001) | (0010) |
| Control | 313H | (11) | (0001) | (0011) |



```

mov AL, 90H
mov DX, 313H
out DX, AL

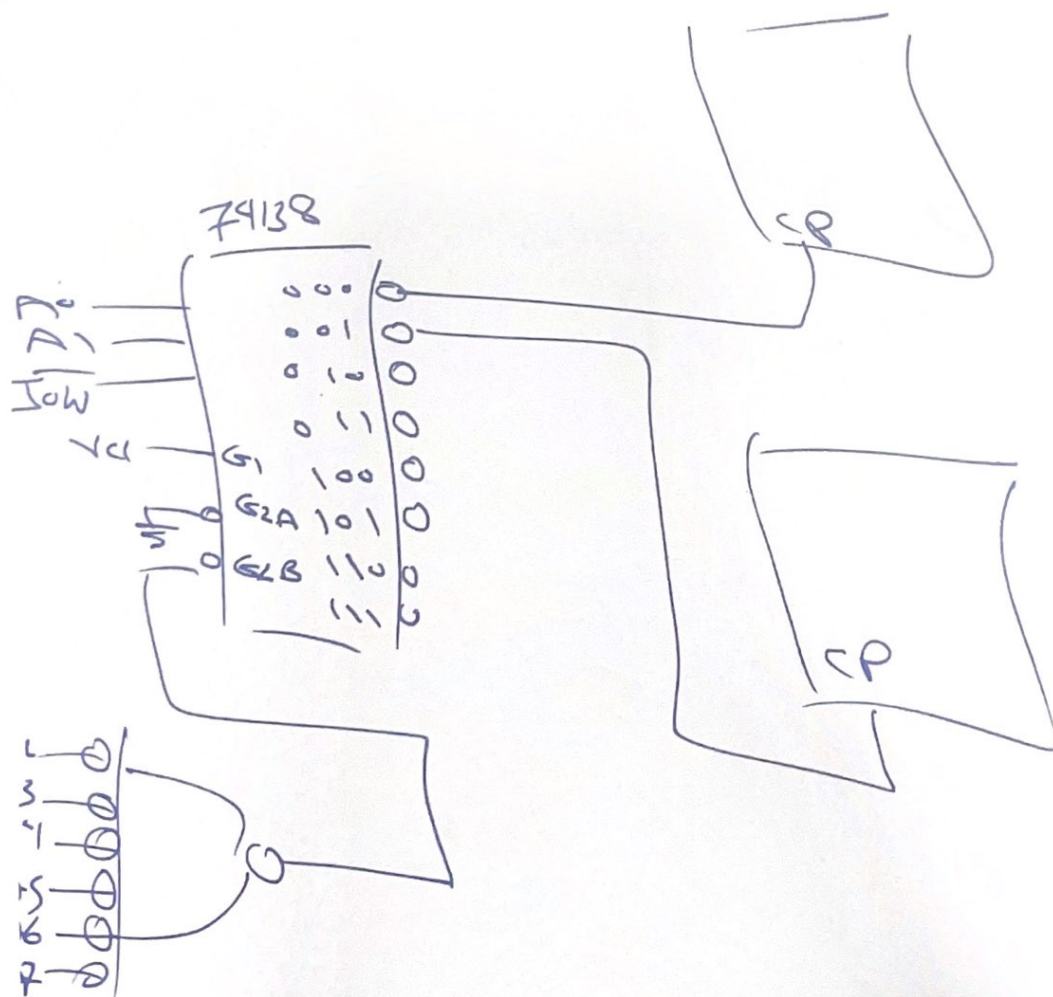
```

```

mov DX, 310H
in AL, DX
mov DX, 311H
out DX, AL
mov DX, 312H
out DX, AL
HLT INT

```

|     | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----|---|---|---|---|---|---|---|---|
| 00A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01A | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 1 |



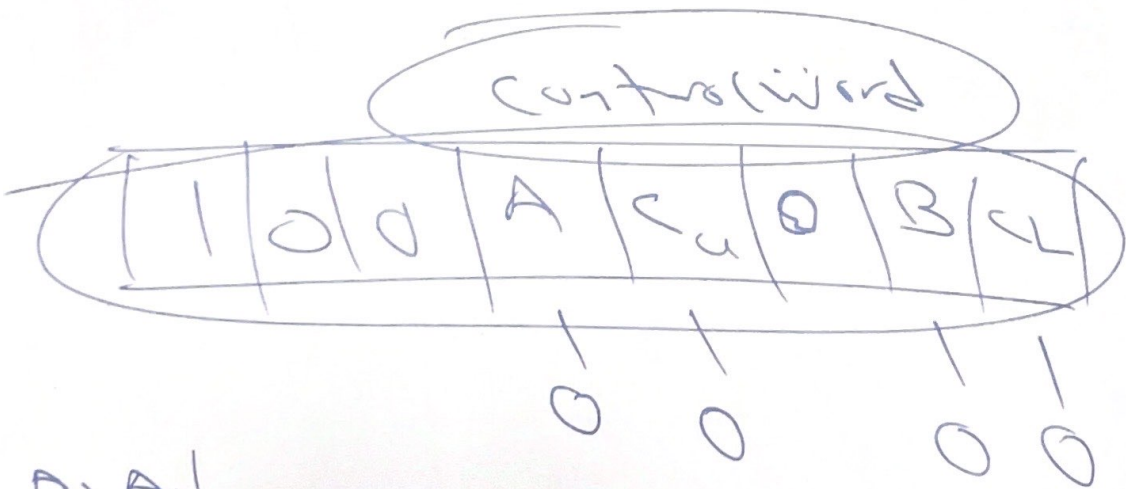
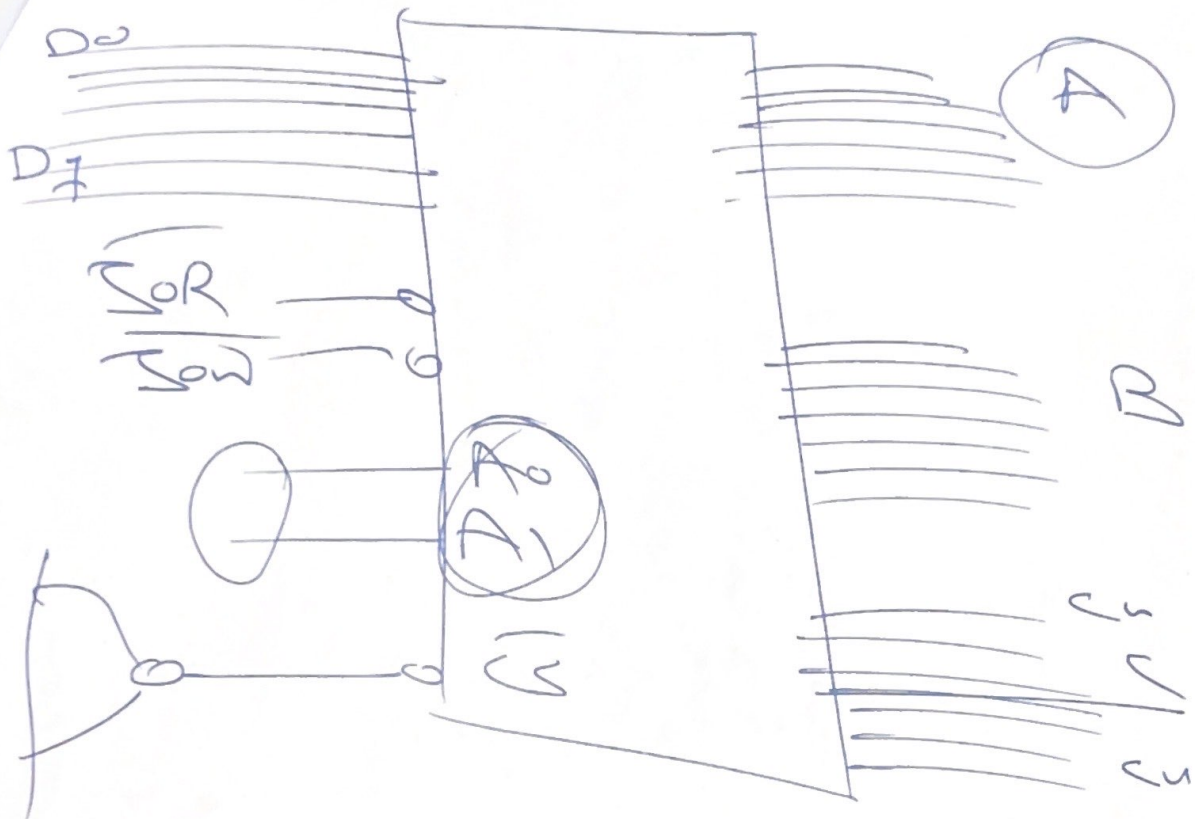


|   |   |   |   |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 |
| 2 | 0 | 1 | 0 |
| 3 | 0 | 1 | 1 |



8255

(F)



| A <sub>1</sub> A <sub>0</sub> |   |         |
|-------------------------------|---|---------|
| 0                             | 0 | A       |
| 0                             | 1 | B       |
| 1                             | 0 | C       |
| 1                             | 1 | Control |

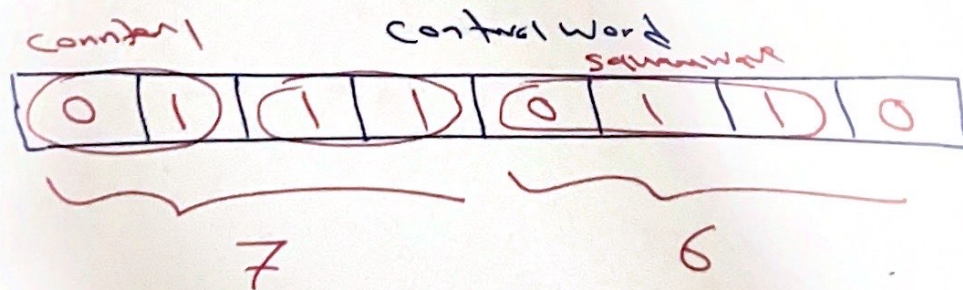
Q = By using 8254 PPI with start address 90H for generating the following signal from counter 1 if the clock input 1MHz and the count is 250H, design the interfacing circuit, find the time of the signal, and required instructions

Solution:-

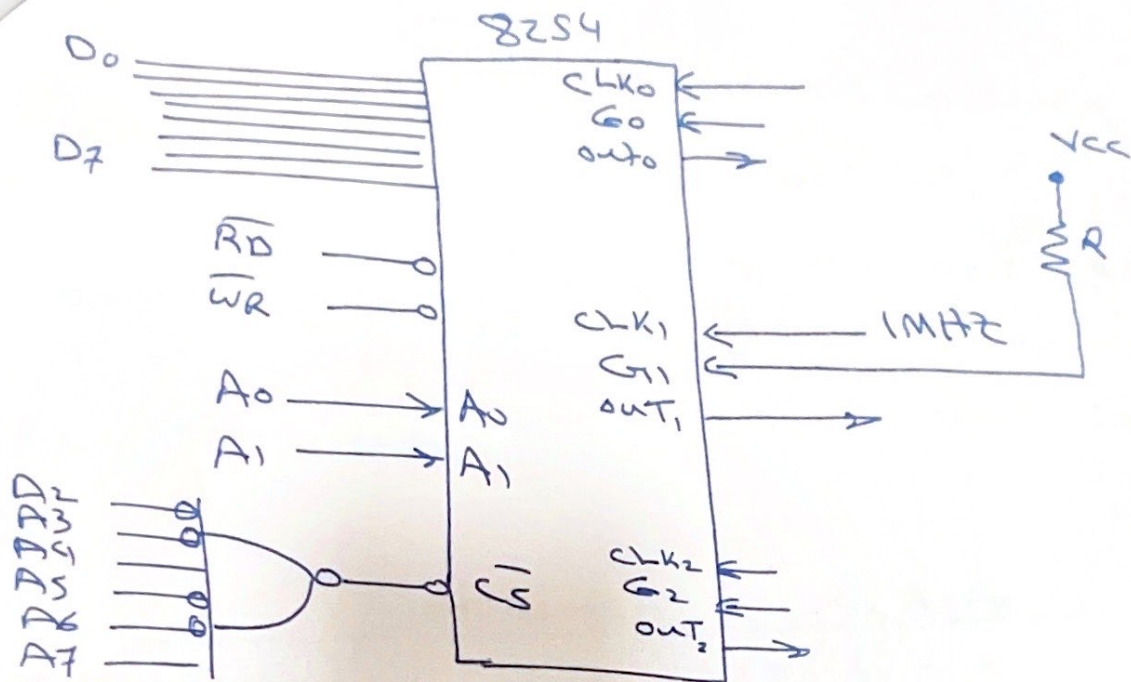
|              |     | A <sub>7</sub> A <sub>6</sub> A <sub>5</sub> A <sub>4</sub> | A <sub>3</sub> A <sub>2</sub> A <sub>1</sub> A <sub>0</sub> |
|--------------|-----|-------------------------------------------------------------|-------------------------------------------------------------|
| Counter 0    | 90H | 1 0 0 1                                                     | 0 0 0 0                                                     |
| Counter 1    | 91H | 1 0 0 1                                                     | 0 0 0 1                                                     |
| Counter 2    | 92H | 1 0 0 1                                                     | 0 0 1 0                                                     |
| Control word | 93H | 1 0 0 1                                                     | 0 0 1 1                                                     |

Counter 1

Let output signal square wave mode 3



76H



```

mov AL, 76H
out 93H, AL
mov AX, 250H
out 91H, AL
mov AL, AH
out 91H, AL
HLT

```

$$f_{out} = \frac{f_{CLK}}{N} = \frac{1 \times 10^6}{592} = 1689.12 \approx 1689.12 \text{ Hz}$$

250H  $\rightarrow$  592

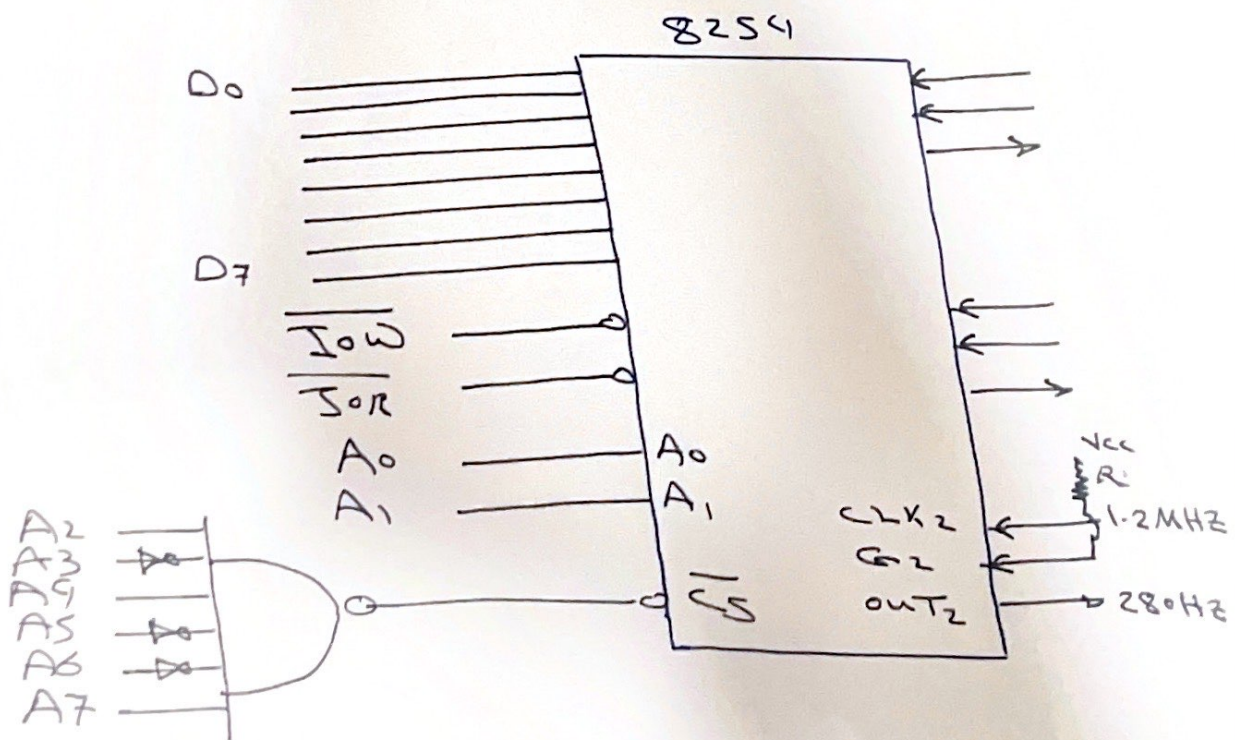
$$T_{out} = \frac{1}{f_{out}} = \frac{1}{1689.12} = 5.92 \times 10^{-4} = 0.592 \times 10^{-3} \text{ sec} = 0.592 \text{ msec}$$

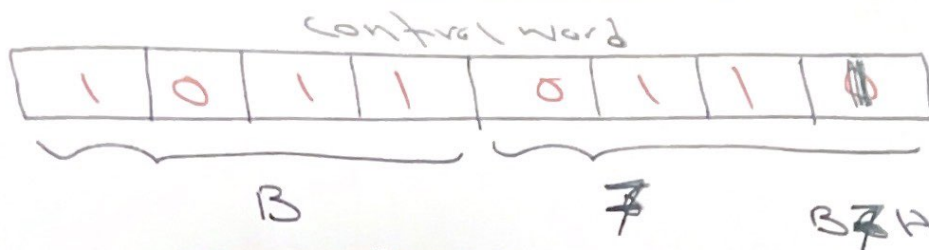
Q2 Design an interfacing circuit by using 8254 when CS address is

$A_7-A_2 = 100101$  find counter address and program for generating square wave with output frequency 280Hz if CLK2 is 1.2MHz

ans

|              |     | $A_7$ | $A_6$ | $A_5$ | $A_4$ | $A_3$ | $A_2$ | $A_1$ | $A_0$ |
|--------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| Counter 0    | 94H | 1     | 0     | 0     | 1     | 0     | 1     | 0     | 0     |
| Counter 1    | 95H | 1     | 0     | 0     | 1     | 0     | 1     | 0     | 1     |
| Counter 2    | 96H | 1     | 0     | 0     | 1     | 0     | 1     | 1     | 0     |
| Counter/word | 97H | 1     | 0     | 0     | 1     | 0     | 1     | 1     | 1     |





$$\text{no. of count} = \frac{f_{\text{clk}}}{f_{\text{out}}} = \frac{1.2 \times 10^6}{280} = 4285.7$$

$$= 4286$$

MOV AL, B7H

OUT 97H, AL

MOV AX, 4286H

MOV 96H, AL

MOV AL, AH

OUT 96H, AL

HLT