भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Name: T. Siva Gayathri

Roll No.: FWC22037

ASSIGNMENT-1

0.1 Question-2013 Section D Q6(d)

Obtain the Minimal Form for the Boolean Expression:
H(P,Q,R,S)=$\sum(0,1,2,3,5,7,8,9,10,14,15)$

0.2 Contents

Abstract- **This manual shows how to use 7447 BCD-seven segment display encoder to display Boolean Logic**

0.3 Components

Component	Value	Quantity
Resistor	220 Ohm	1
Arduino	UNO	1
Seven Segment Display		1
Decoder	7447	1
Jumper Wires	M-M	20
Breadboard		1

Table 3.0

0.4 Hardware

1.Make connections between seven segment display and the 7447 ic as per the given table.

7447	a'	b'	c'	d'	e'	f'	g'
Display	a	b	c	d	e	f	g

Table 4.0

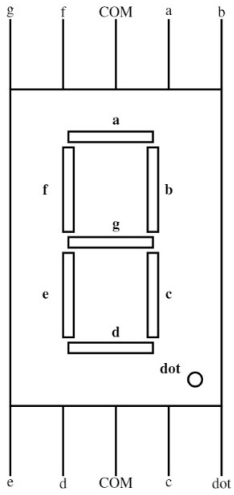

Figure 1: Pin diagram for Seven Segment

Figure 2: Pin diagram for 7447

2.Make the connections between the Arduino and the 7447ic as per the given table.

7447	D	C	B	A
Arduino	5	4	3	2

Table 4.1

	P	Q	R	S
Input	0	1	1	0
Arduino	6	7	8	9

Table 4.2

3.In this we used the number 5 as an input to the Arduino and that would give the output as 1.

0.5 Solution

Truth Table

P	Q	R	S	H
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

Table 5.0

1.The following K-map is obtained from the above truth table.

2.As we have Four Variables we obtain a 16 cell K-Map

PQ \ RS	00	01	11	10
00	1	1	1	1
01	0	1	1	0
11	0	0	1	1
10	1	1	0	1

Table 5.1

3.Now we do grouping to obtain the minimal expression using the K-Map.

PQ \ RS	00	01	11	10
00	1	1	1	1
01	0	1	1	0
11	0	0	1	1
10	1	1	0	1

Table 5.2

The minterm expression for the two groupings are $\overline{QS}$ and $\overline{P}$S

PQ \ RS	00	01	11	10
00	1	1	1	1
01	0	1	1	0
11	0	0	1	1
10	1	1	0	1

Table 5.3

The minterm expression for the two groupings are PQR and P$\overline{QR}$

PQ \ RS	00	01	11	10
00	1	1	1	1
01	0	1	1	0
11	0	0	1	1
10	1	1	0	1

Table 5.4

The Minimal expression is

H = $\overline{QS}$+$\overline{P}$S+PQR+P$\overline{QR}$S

4.Download the code from the given link and upload to the Arduino.

https://github.com/siva-gayathri/FWC/blob/main/assignment-1/codes/src/main.cpp

5.Go to the working directory execute pio run and pio run -t upload.

6.Whenever you change the inputs you will see the respective output.