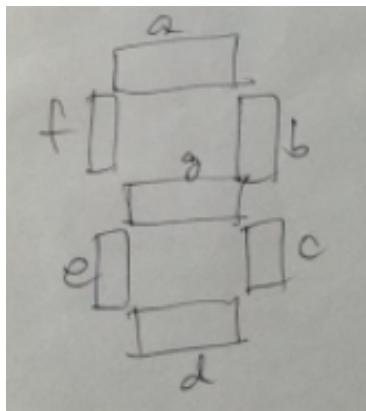


ASSIGNMENT 2:

Roshan Raj(2019CS50437) Anannya Mathur(2019TT10953)

A, B, C, D represent the 4 bit values taken as input.

a, b, c, d, e, f, g represent the 7 segment display.



TRUTH TABLE

	A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1
A	1	0	1	0	1	1	1	0	1	1	1
b	1	0	1	1	0	0	1	1	1	1	1
C	1	1	0	0	1	0	0	1	1	1	0
d	1	1	0	1	0	1	1	1	1	0	1
E	1	1	1	0	1	0	0	1	1	1	1
F	1	1	1	1	1	0	0	0	1	1	1

Generating K-maps:

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

$$a = \overline{BD} + A\overline{B}\overline{C} + A\overline{D} + BC + \cancel{AC} + \overline{ABD}$$

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

$$b = \overline{AB} + \overline{AC}\overline{D} + \overline{A}CD + \overline{ACD} + \overline{BD}$$

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

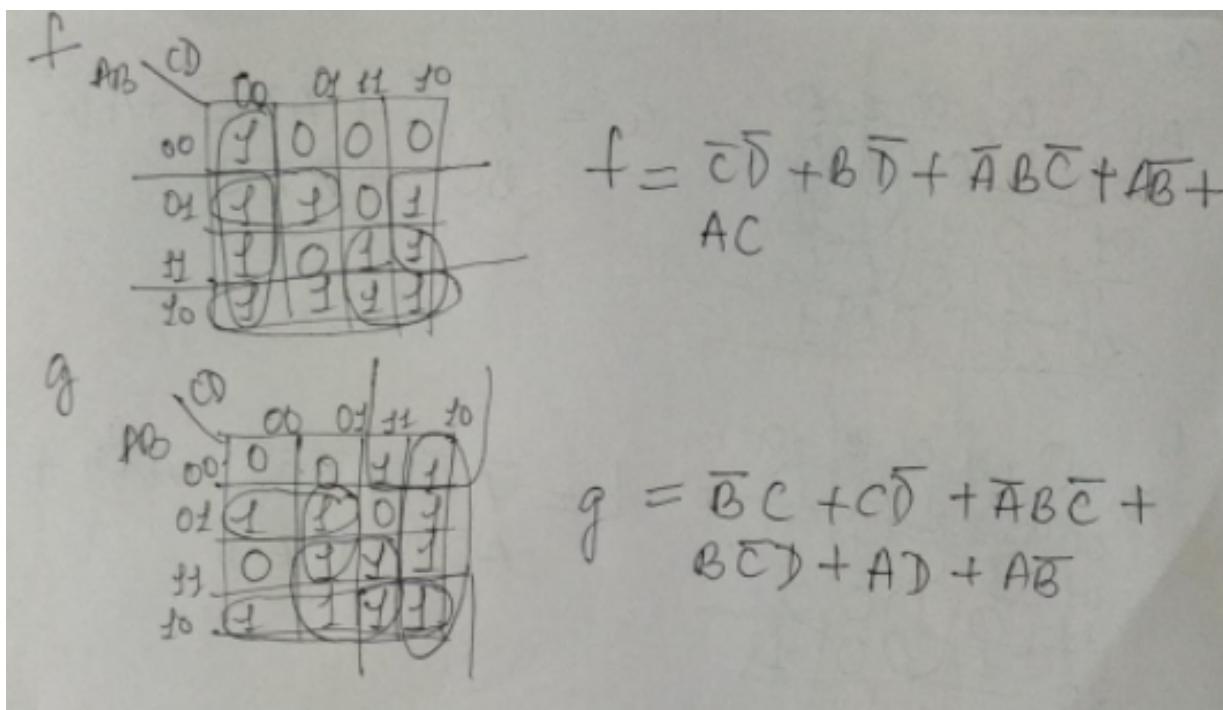
$$c = \overline{AC} + \overline{AD} + \overline{AB} + A\overline{B} + \overline{CD}$$

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

$$d = \overline{AB}\overline{D} + A\overline{C} + A\overline{B}D + BC + \overline{BCD} + A\overline{B}C$$

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

$$e = \overline{BD} + \cancel{CD} + AB + AC$$



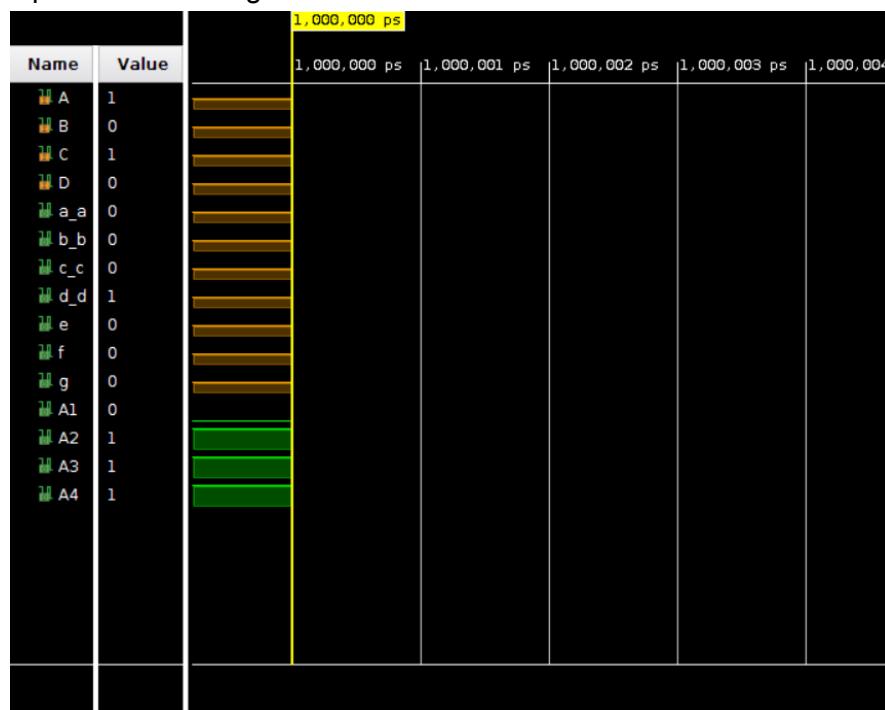
Simulation Results-

A, B, C, D= 4-bit input

a_a, b_b, c_c, d_d, e, f, g= 7 segment display(output)

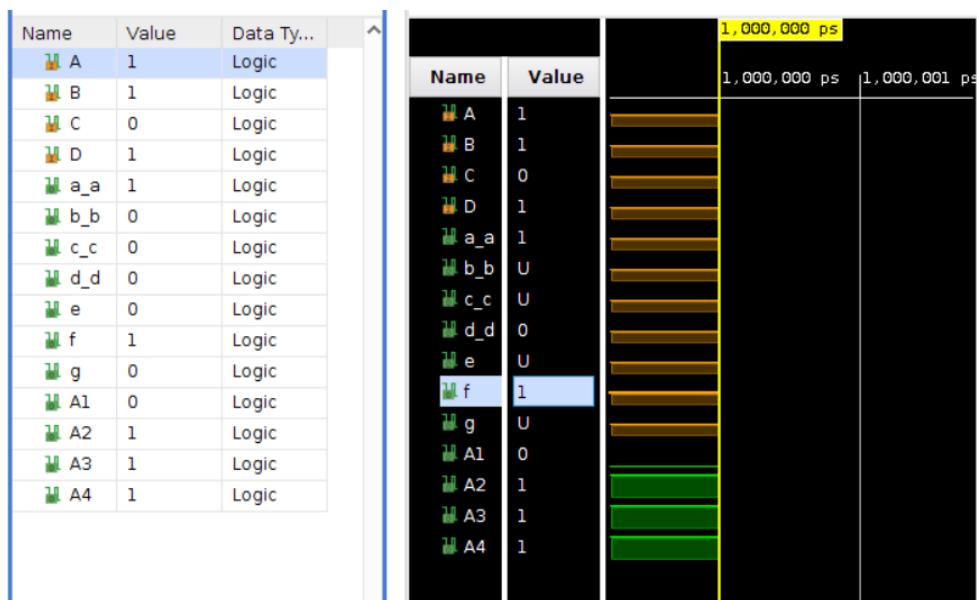
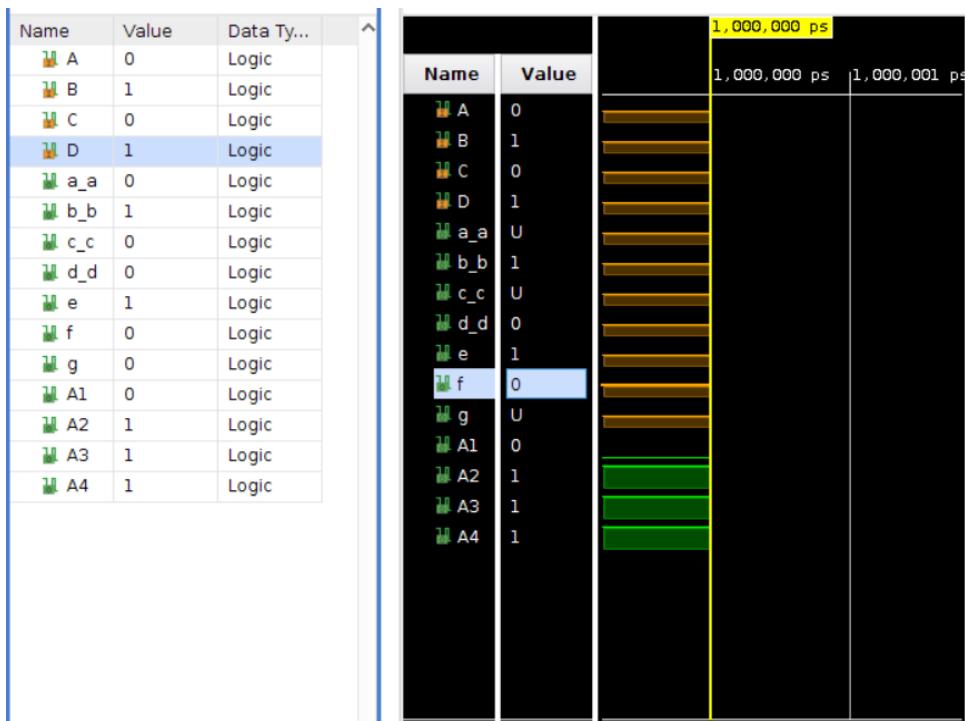
A1, A2, A3, A4- to indicate which anode to be used.

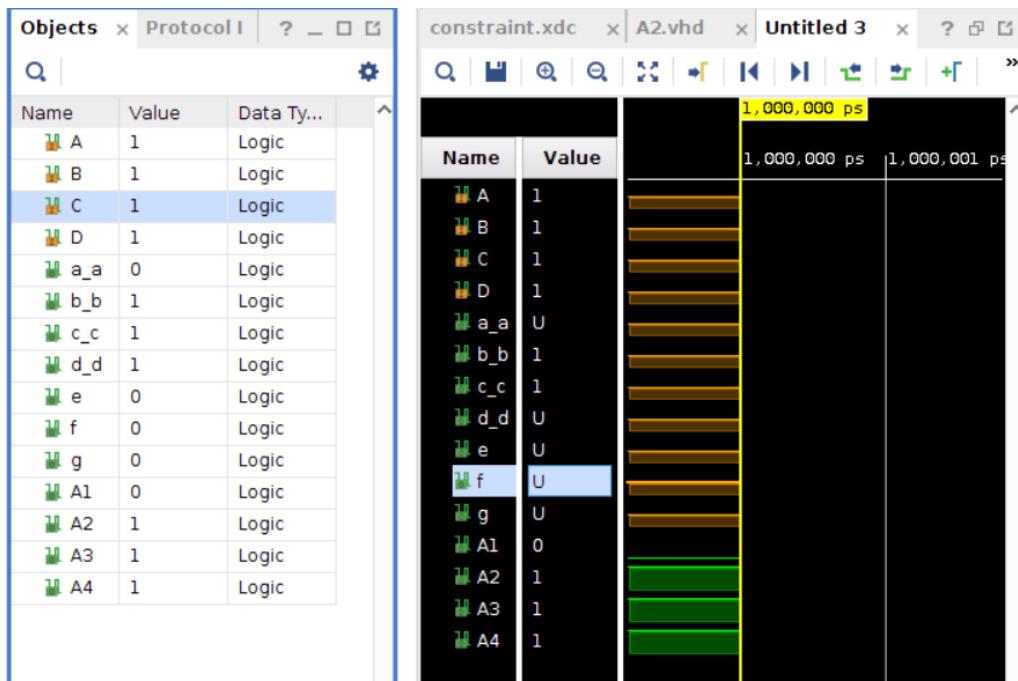
For the 7 segments display and the anodes, '1' represents 'to not be lighted' while '0' represents 'to be lighted'.



Name	Value	1,000,000 ps				
		1,000,000 ps	1,000,001 ps	1,000,002 ps	1,000,003 ps	1,000,004
■ A	1	█				
■ B	0	█				
■ C	1	█				
■ D	1	█				
■ a_a	1	█				
■ b_b	1	█				
■ c_c	0	█				
■ d_d	0	█				
■ e	0	█				
■ f	0	█				
■ g	0	█				
■ A1	0	█				
■ A2	1	█				
■ A3	1	█				
■ A4	1	█				

Name	Value	1,000,000 ps				
		1,000,000 ps	1,000,001 ps	1,000,002 ps	1,000,003 ps	1,000,004
■ A	1	█				
■ B	1	█				
■ C	0	█				
■ D	0	█				
■ a_a	U	█				
■ b_b	1	█				
■ c_c	1	█				
■ d_d	0	█				
■ e	0	█				
■ f	0	█				
■ g	1	█				
■ A1	0	█				
■ A2	1	█				
■ A3	1	█				
■ A4	1	█				





Constraints file(.xdc)-

```
set_property PACKAGE_PIN V17 [get_ports {D}]
  set_property IOSTANDARD LVCMOS33 [get_ports {D}]
set_property PACKAGE_PIN V16 [get_ports {C}]
  set_property IOSTANDARD LVCMOS33 [get_ports {C}]
set_property PACKAGE_PIN W16 [get_ports {B}]
  set_property IOSTANDARD LVCMOS33 [get_ports {B}]
set_property PACKAGE_PIN W17 [get_ports {A}]
  set_property IOSTANDARD LVCMOS33 [get_ports {A}]
```

We assigned pin W17 to A, W16 to B, V16 to C and V17 to D.

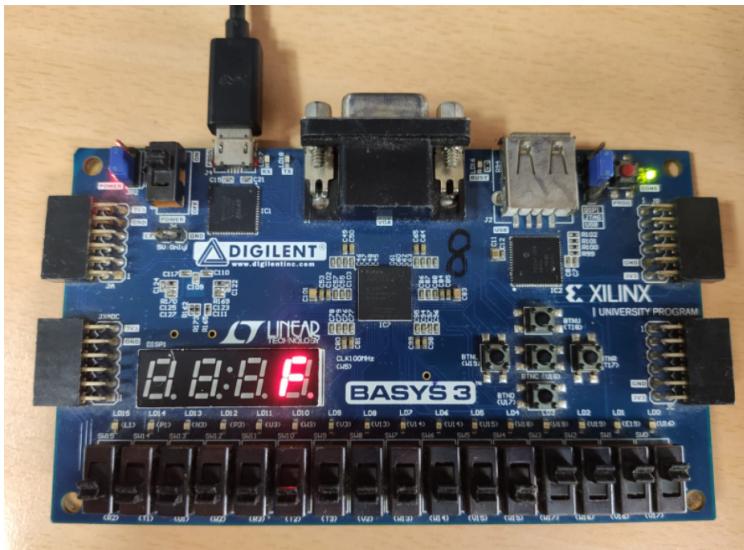
```
##7 segment display
set_property PACKAGE_PIN W7 [get_ports {a_a}]
  set_property IOSTANDARD LVCMOS33 [get_ports {a_a}]
set_property PACKAGE_PIN W6 [get_ports {b_b}]
  set_property IOSTANDARD LVCMOS33 [get_ports {b_b}]
set_property PACKAGE_PIN U8 [get_ports {c_c}]
  set_property IOSTANDARD LVCMOS33 [get_ports {c_c}]
set_property PACKAGE_PIN V8 [get_ports {d_d}]
  set_property IOSTANDARD LVCMOS33 [get_ports {d_d}]
set_property PACKAGE_PIN U5 [get_ports {e}]
  set_property IOSTANDARD LVCMOS33 [get_ports {e}]
set_property PACKAGE_PIN V5 [get_ports {f}]
  set_property IOSTANDARD LVCMOS33 [get_ports {f}]
set_property PACKAGE_PIN U7 [get_ports {g}]
  set_property IOSTANDARD LVCMOS33 [get_ports {g}]
```

To assign which anode to be used:

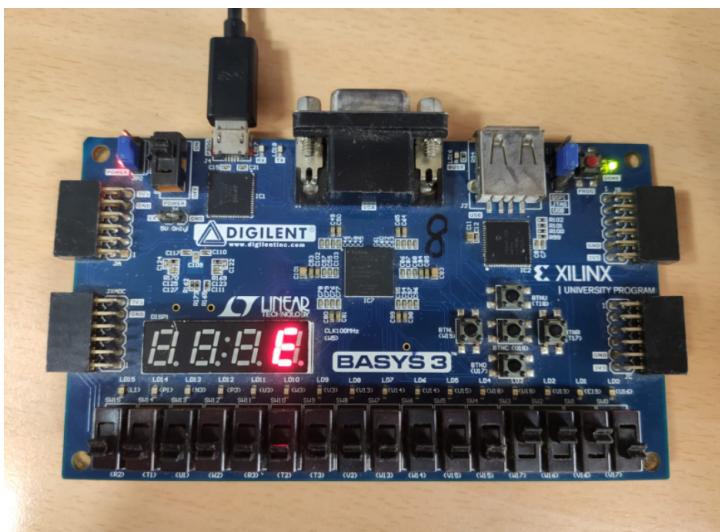
```
set_property PACKAGE_PIN V7 [get_ports dp]
  set_property IOSTANDARD LVCMOS33 [get_ports dp]

set_property PACKAGE_PIN U2 [get_ports {A1}]
  set_property IOSTANDARD LVCMOS33 [get_ports {A1}]
set_property PACKAGE_PIN U4 [get_ports {A2}]
  set_property IOSTANDARD LVCMOS33 [get_ports {A2}]
set_property PACKAGE_PIN V4 [get_ports {A3}]
  set_property IOSTANDARD LVCMOS33 [get_ports {A3}]
set_property PACKAGE_PIN W4 [get_ports {A4}]
  set_property IOSTANDARD LVCMOS33 [get_ports {A4}]
```

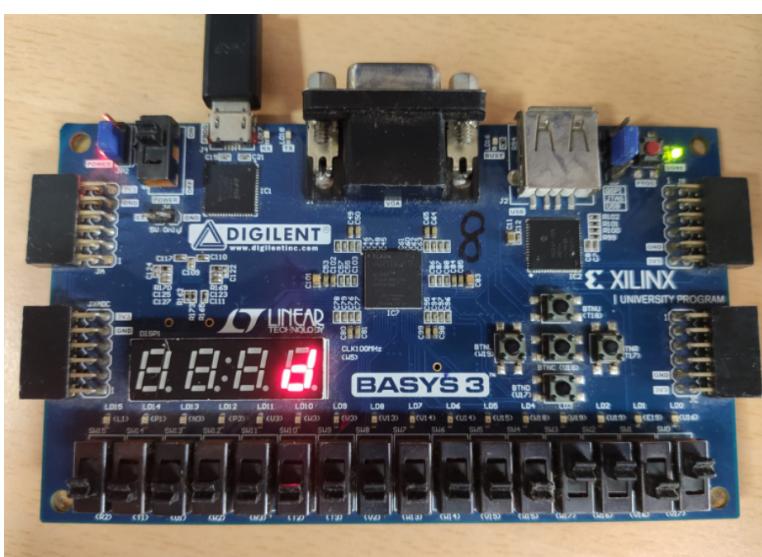
INPUT-1111



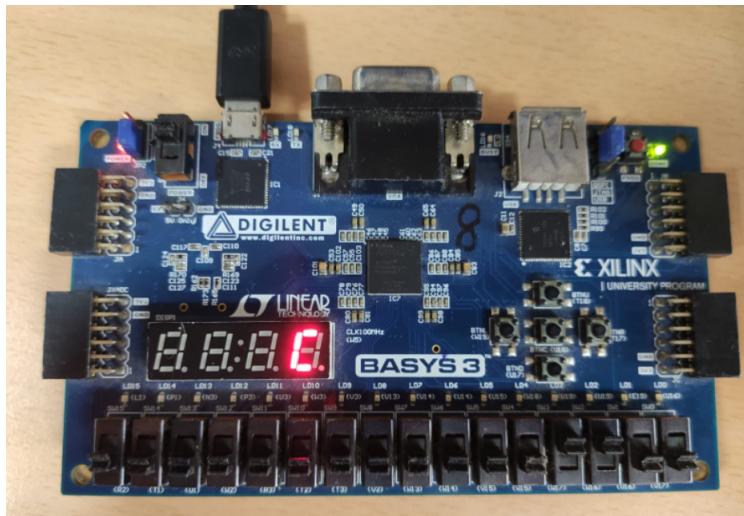
INPUT-1110



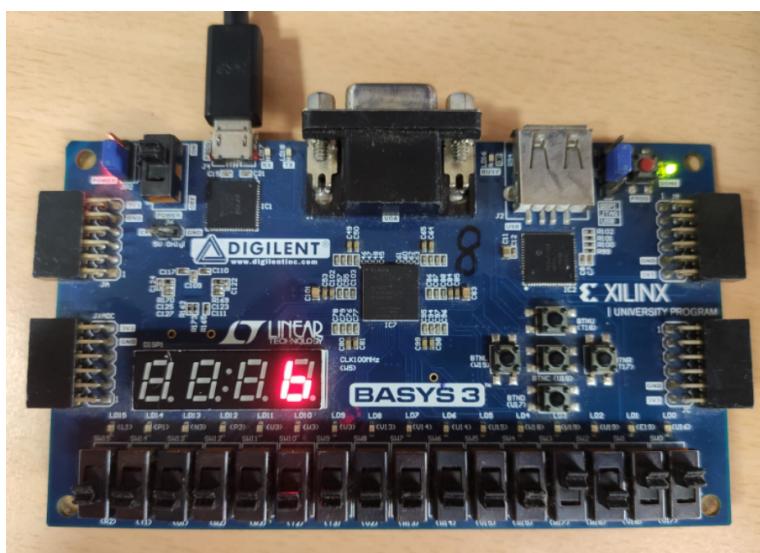
INPUT-1101



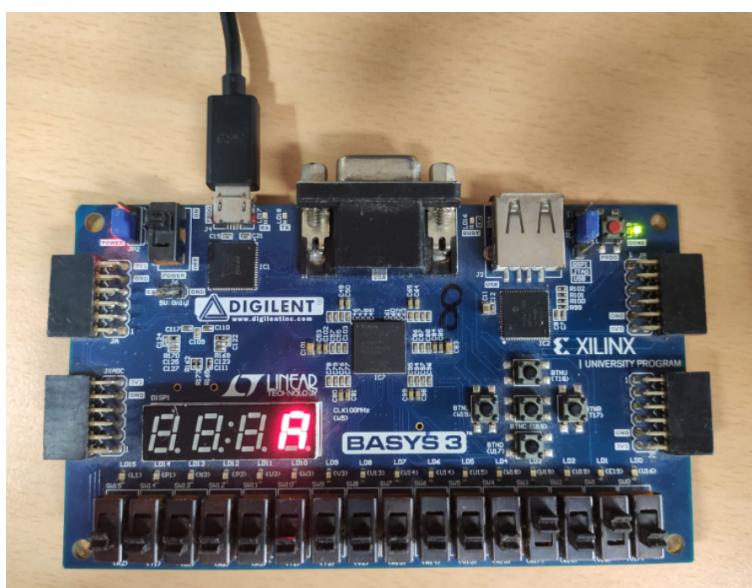
INPUT-1100



INPUT-1011



INPUT-1010

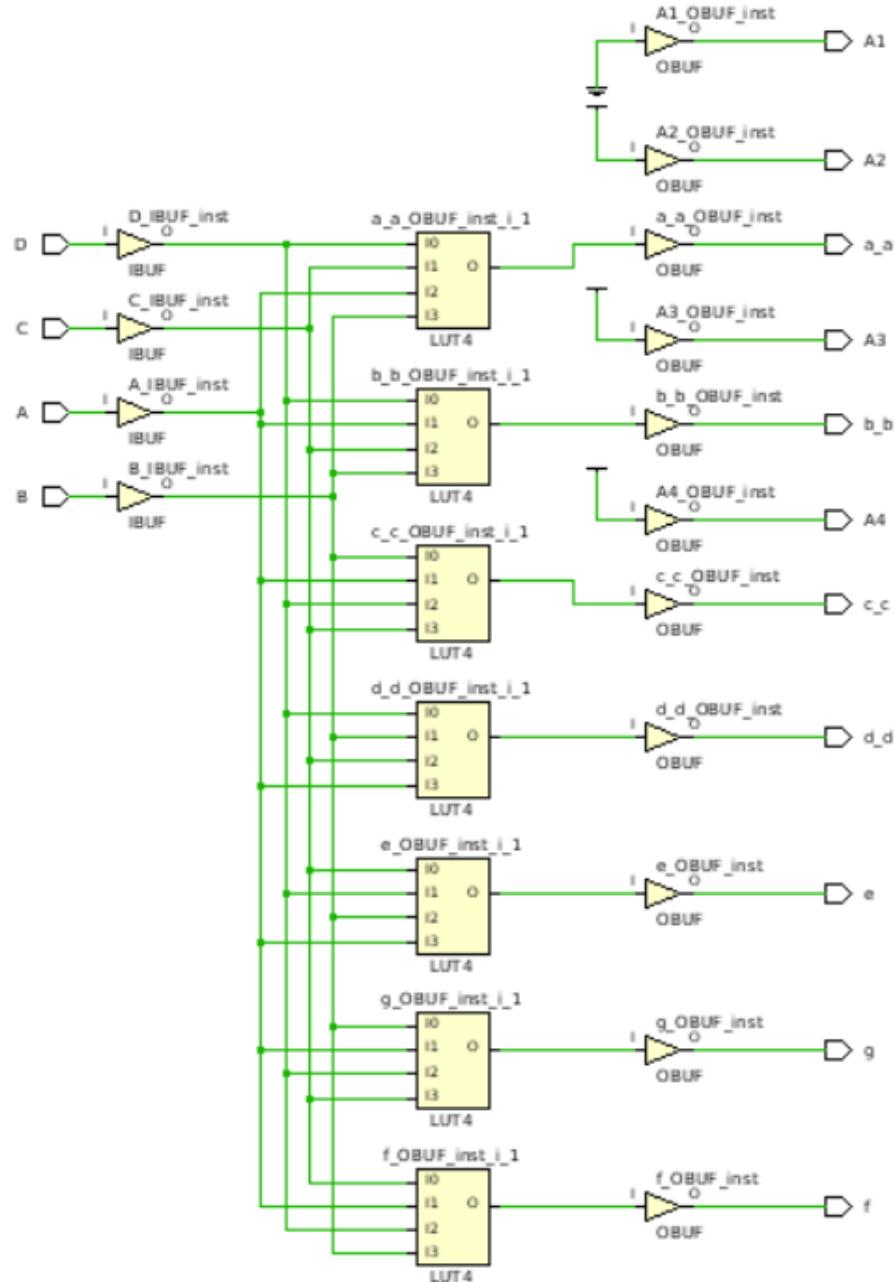


RESOURCE COUNT:

A, B, C, D= 4-bit input

a_a, b_b, c_c, d_d, e, f, g= 7 segment display(output)

A1, A2, A3, A4- to indicate which anode to be used.



Flipflops-0

LUTs-7

BRAMs-0

DSPs-0

Observations- We observe that our results match the expected values, thus we can conclude that our algorithm works right.