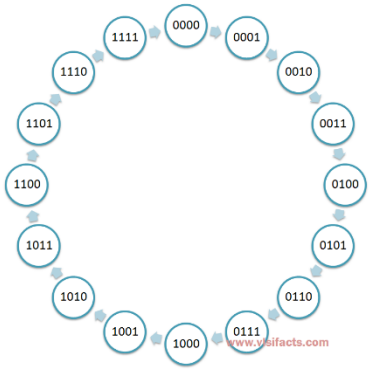
AKDENİZ UNIVERSITY
CSE 211 – Digital Design

LAB08 Assignment

Your task is to design 4 bit binary counter using T Type Flip Flops.



- First, fill the state table in the second page in this document
- Then, fill the karnough maps for all flip flops in the second page of this document. Then find the boolean functions.
- Lastly, design your 4-bit counter on Proteus Design Suite. In your design, use a single 7-segment bcd. Counter should start from 0 and increase one per 1 second.
- Count order should be as in state diagram on the right
- Seven segment display should display corresponding BCD value as follows

0 □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ A □ B □ C □ D □ E □ F □ 0 □ 1 …

PS: A template project is given in the attached files.

- **7-SEG-BCD-GRN**: BCD input 7 segment display
- **JKFF**: JK Type Flip Flop (You must use this to create T Type Flip Flop)
- **And Gate**: Logic and gate
- **Logic State, Logic Probe(big)**

Full Name:	İrem KARAKAPLAN
Student No:	20220808056

State Table of 4-bit Binary Counter

Present State				Next State				Flip-Flop Inputs			
A3	**A2**	**A1**	**A0**	**A3**	**A2**	**A1**	**A0**	**TA3**	**TA2**	**TA1**	**TA0**
0	0	0	0	0	0	0	1	0	0	0	1
0	0	0	1	0	0	1	0	0	0	1	1
0	0	1	0	0	0	1	1	0	0	0	1
0	0	1	1	0	1	0	0	0	1	1	1
0	1	0	0	0	1	0	1	0	0	0	1
0	1	0	1	0	1	1	0	0	0	1	1
0	1	1	0	0	1	1	1	0	0	0	1
0	1	1	1	1	0	0	0	1	1	1	1
1	0	0	0	1	0	0	1	0	0	0	1
1	0	0	1	1	0	1	0	0	0	1	1
1	0	1	0	1	0	1	1	0	0	0	1
1	0	1	1	1	1	0	0	0	1	1	1
1	1	0	0	1	1	0	1	0	0	0	1
1	1	0	1	1	1	1	0	0	0	1	1
1	1	1	0	1	1	1	1	0	0	0	1
1	1	1	1	0	0	0	0	1	1	1	1

A1, A0 **A3, A2**	**00**	**01**	**11**	**10**
00	0	0	1	0
01	0	0	1	0
11	0	0	1	0
10	0	0	1	0

$$T_{A2} = \sum \left(m(3,7,11,15)\right)$$

A1, A0 **A3, A2**	**00**	**01**	**11**	**10**
00	0	0	0	0
01	0	0	1	0
11	0	0	1	0
10	0	0	0	0

$$T_{A3} = \sum \left(m(7,15)\right)$$

Karnough Maps

A1, A0 A3, A2	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1

$T_{A0} = \sum \quad (m(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15))$

A1, A0 A3, A2	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

$T_{A1} = \sum \quad (m(1,3,5,7,9,11,13,15))$