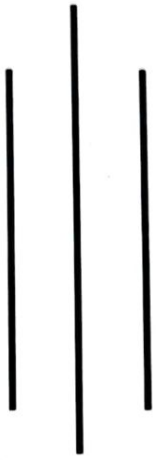
TRIBHUVAN UNIVERSITY

PATAN MULTIPLE CAMPUS

PATAN DHOKA, LALITPUR



DIGITAL LOGIC (BIT 103)

LAB ..11..

SUBMITTED BY

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DATE: ...2080/12/22

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TITLE:- DESIGN MOD-11 SYNCHRONOUS UP COUNTER WITH STATE DIAGRAM, TRANSITION TABLE AND TIMING DIAGRAM.

a) OBJECTIVE

→ To design mod-11 synchronous up counter with state diagram, transition table and timing diagram

b) REQUIREMENTS

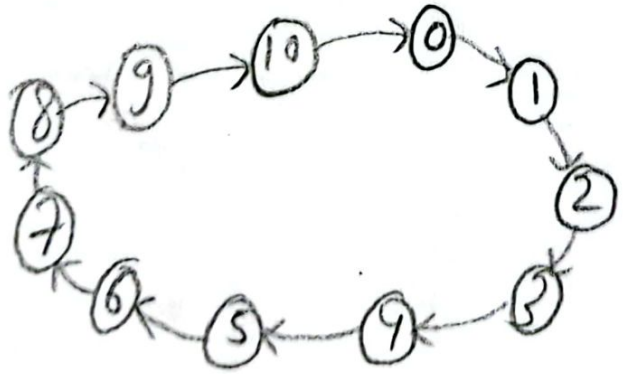
i) Digital logic kit and simulator
ii) 4 JK flip-flop
iii) Clock, interactive input
iv) Connecting wires
v) LED as output

c) THEORY

1.) INTRODUCTION :-

mod (modules) - 11 synchronous up counter is a sequential logic ~~circuit~~ which contains 4 flip-flops as we need 4-bit to represent 10 in binary i.e. 1010. It counts from 0-10 and then cycles back to 0.

2.) STATE DIAGRAM



3. TRANSITION TABLE

Prev state				Next state				Excitation			
Q_4	Q_3	Q_2	Q_1	Q_4	Q_3	Q_2	Q_1	J_4K_4	J_3K_3	J_2K_2	J_1K_1
0	0	0	0	0	0	0	1	0X	0X	0X	1X
0	0	0	1	0	0	1	0	0X	0X	1X	X1
0	0	1	0	0	0	1	1	0X	0X	X0	1X
0	0	1	1	0	1	0	0	0X	1X	X1	X1
0	1	0	0	0	1	0	1	0X	X0	0X	1X
0	1	0	1	0	1	1	0	0X	X0	X1X	X1
0	1	1	0	0	1	1	1	0X	X0	X0	1X
0	1	1	1	1	0	0	0	1X	X1	X1	X1
1	0	0	0	1	0	0	1	X0	0X	0X	1X
1	0	0	1	1	0	1	0	X0	0X	1X	X1
1	0	1	0	0	0	0	0	X1	0X	X1	0X

4.) EQUATIONS:- For J_4

Q_4Q_3 \ Q_2Q_1	$\bar{Q}_2\bar{Q}_1$	$\bar{Q}_2Q_1$	Q_2Q_1	$Q_2\bar{Q}_1$
$\bar{Q}_4\bar{Q}_3$	0	0	0	0
$\bar{Q}_4Q_3$	0	0	1	0
Q_4Q_3	X	X	X	X
$Q_4\bar{Q}_3$	X	X	X	X

$$J_4 = Q_3Q_2\bar{Q}_1$$

For K_4

Q_4Q_3 \ Q_2Q_1	$\bar{Q}_2\bar{Q}_1$	$\bar{Q}_2Q_1$	Q_2Q_1	$Q_2\bar{Q}_1$
$\bar{Q}_4\bar{Q}_3$	X	X	X	X
$\bar{Q}_4Q_3$	X	X	X	X
Q_4Q_3	X	X	X	X
$Q_4\bar{Q}_3$	0	0	X	1

$$K_4 = Q_2$$

For J_3

Q_4Q_3 \ Q_2Q_1	$\bar{Q}_2\bar{Q}_1$	$\bar{Q}_2Q_1$	Q_2Q_1	$Q_2\bar{Q}_1$
$\bar{Q}_4\bar{Q}_3$	0	0	1	0
$\bar{Q}_4Q_3$	X	X	X	X
Q_4Q_3	X	X	X	X
$Q_4\bar{Q}_3$	0	0	X	0

$J_3 = Q_2Q_1$

For K_3

Q_4Q_3 \ Q_2Q_1	$\bar{Q}_2\bar{Q}_1$	$\bar{Q}_2Q_1$	Q_2Q_1	$Q_2\bar{Q}_1$
$\bar{Q}_4\bar{Q}_3$	X	X	X	X
$\bar{Q}_4Q_3$	0	0	1	0
Q_4Q_3	X	X	X	X
$Q_4\bar{Q}_3$	X	X	X	X

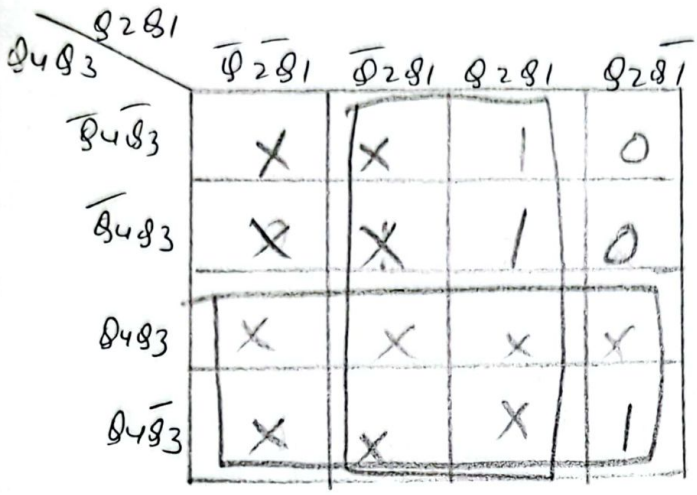
$K_3 = Q_2Q_1$

For J_2

Q_4Q_3 \ Q_2Q_1	$\bar{Q}_2\bar{Q}_1$	$\bar{Q}_2Q_1$	Q_2Q_1	$Q_2\bar{Q}_1$
$\bar{Q}_4\bar{Q}_3$	0	1	X	X
$\bar{Q}_4Q_3$	0	1	X	X
Q_4Q_3	X	X	X	X
$Q_4\bar{Q}_3$	0	1	X	X

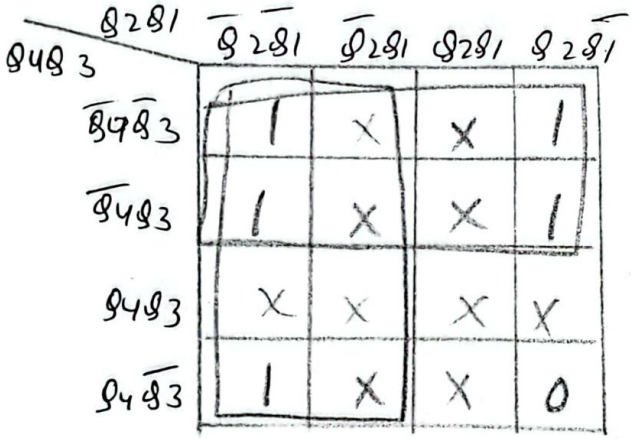
$J_2 = Q_1$

For K_2



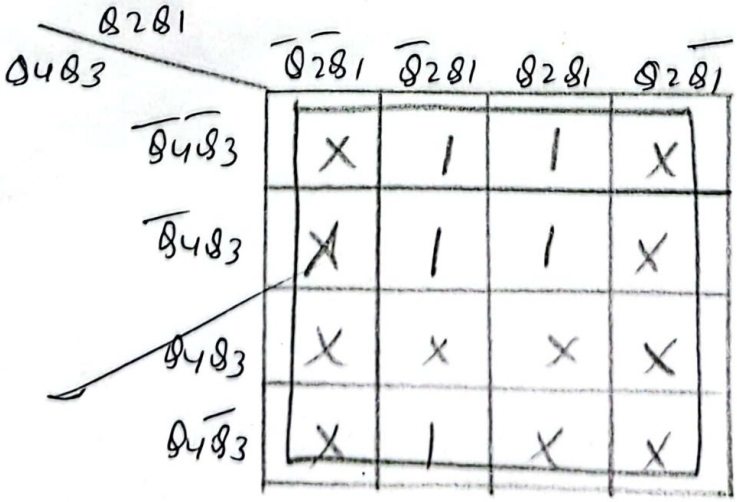
$K_2 = Q_1 + Q_4$

For J_1



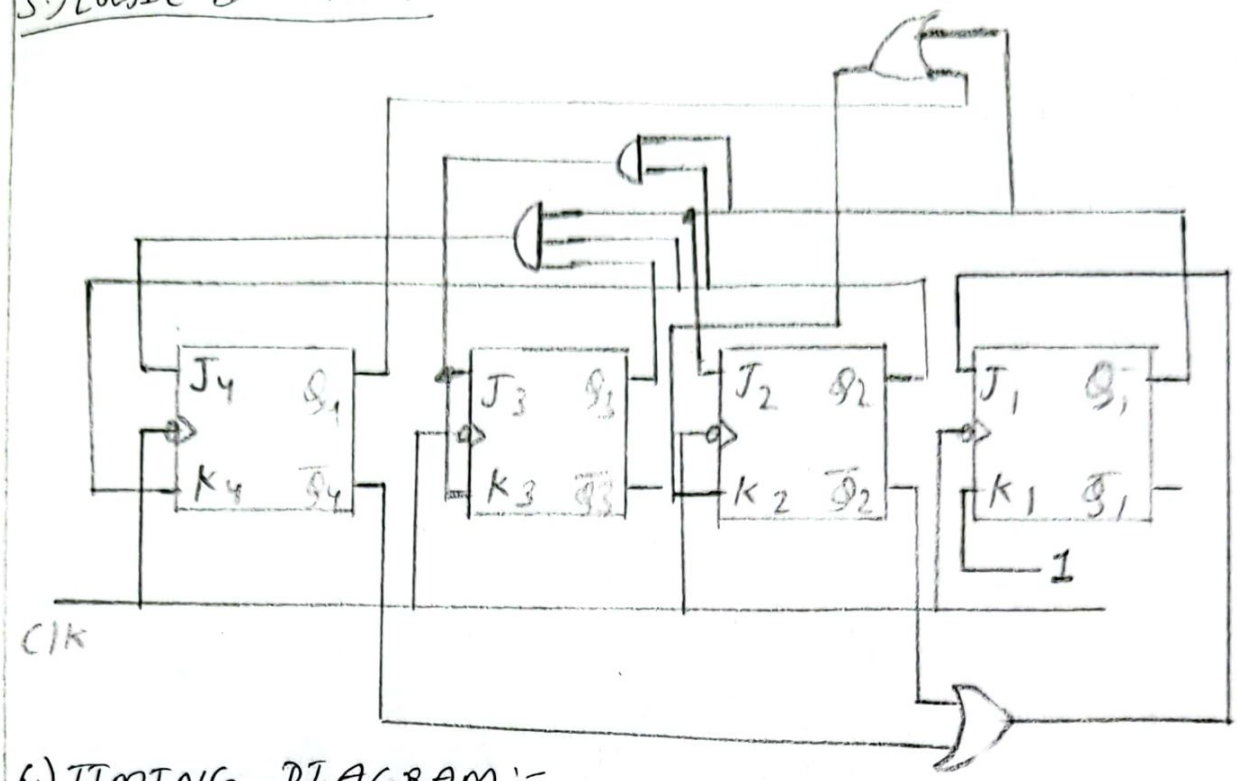
$J_1 = \bar{Q}_4 + \bar{Q}_2$

For K_1

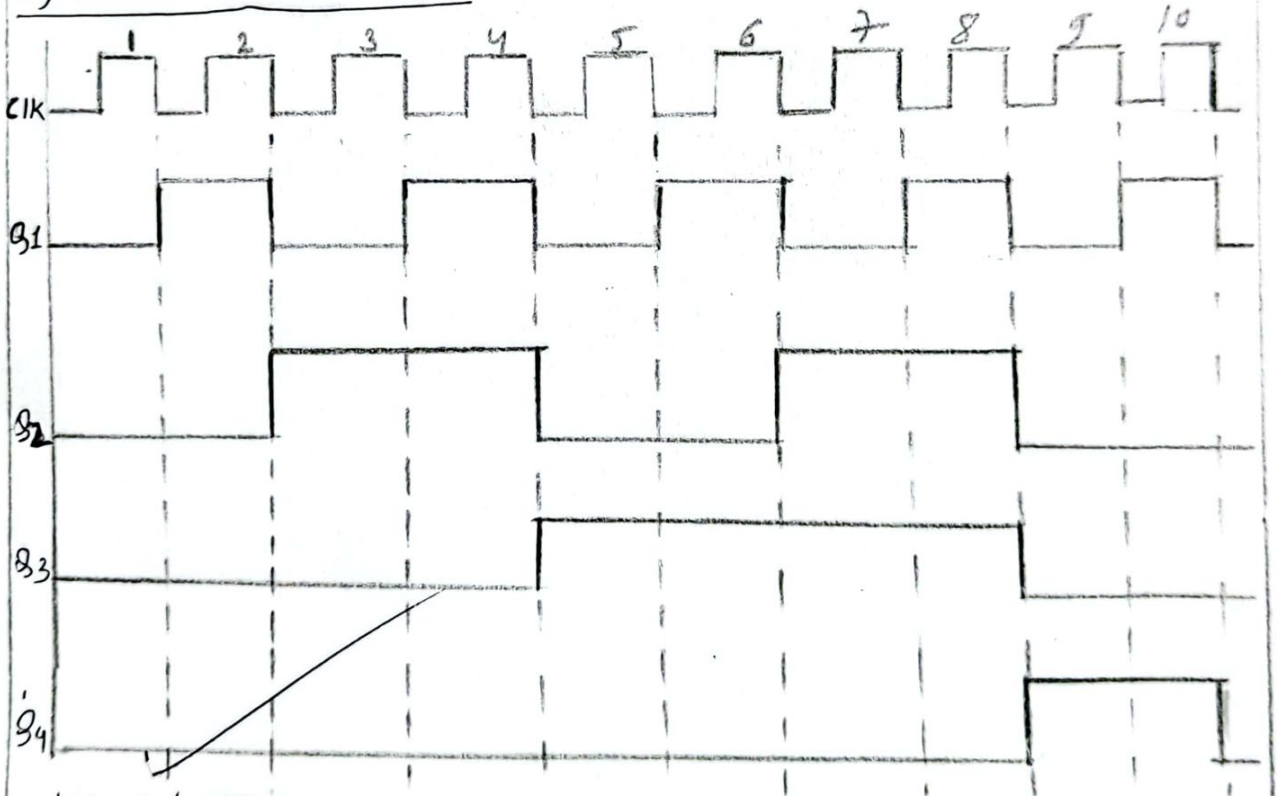


$K_1 = 1$

5.) LOGIC DIAGRAM



6.) TIMING DIAGRAM :-



7.) CONCLUSION :-

In this lab, we have designed a mod-11 synchronous up counter with transition table, logic diagram and timing diagram and state diagram.

08/11/22