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EXPEERIMENT 9: FLIP FLOPS

PART A:

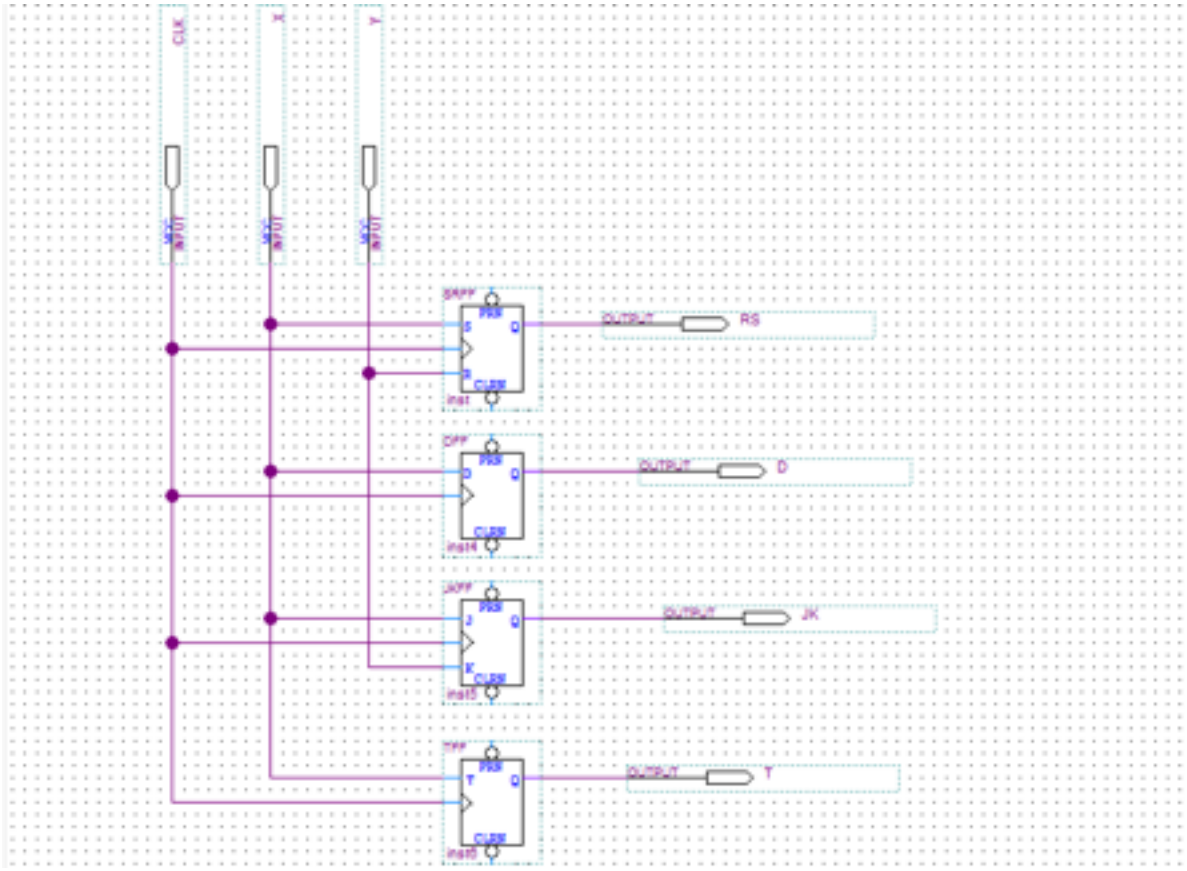
AIM:

To verify the RS, D, JK and T flip flops.

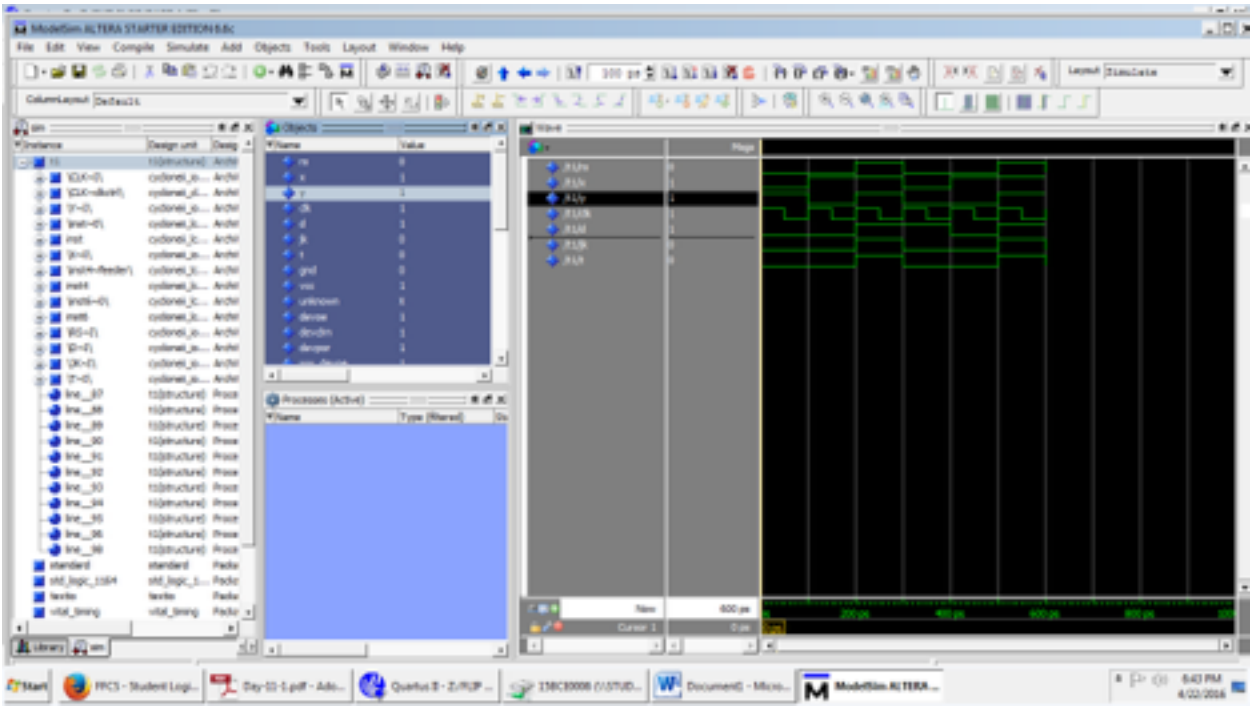
TRUTH TABLE:

Q_t	**A**	**B**	**S-R Q_{t+1}**	**J-K Q_{t+1}**	**D(inp:A) Q_{t+1}**	**T(inp:A) Q_{t+1}**
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	1	1	1	1
0	1	1	IND	1	1	1
1	0	0	1	1	0	1
1	0	1	0	0	0	1
1	1	0	1	1	1	0
1	1	1	IND	0	1	0

CIRCUIT DIAGRAM:



WAVEFORM:



PART B:

AIM:

Design and implement three bit synchronous binary up-counter.

TRUTH TABLE:

At	Bt	Ct	At+1	Bt+1	Ct+1	TA	TB	TC
0	0	0	0	0	1	0	0	1
0	0	1	0	1	0	0	1	1
0	1	0	0	1	1	0	0	1
0	1	1	1	0	0	1	1	1
1	0	0	1	0	1	0	0	1
1	0	1	1	1	0	0	1	1
1	1	0	1	1	1	0	0	1
1	1	1	0	0	0	1	1	1

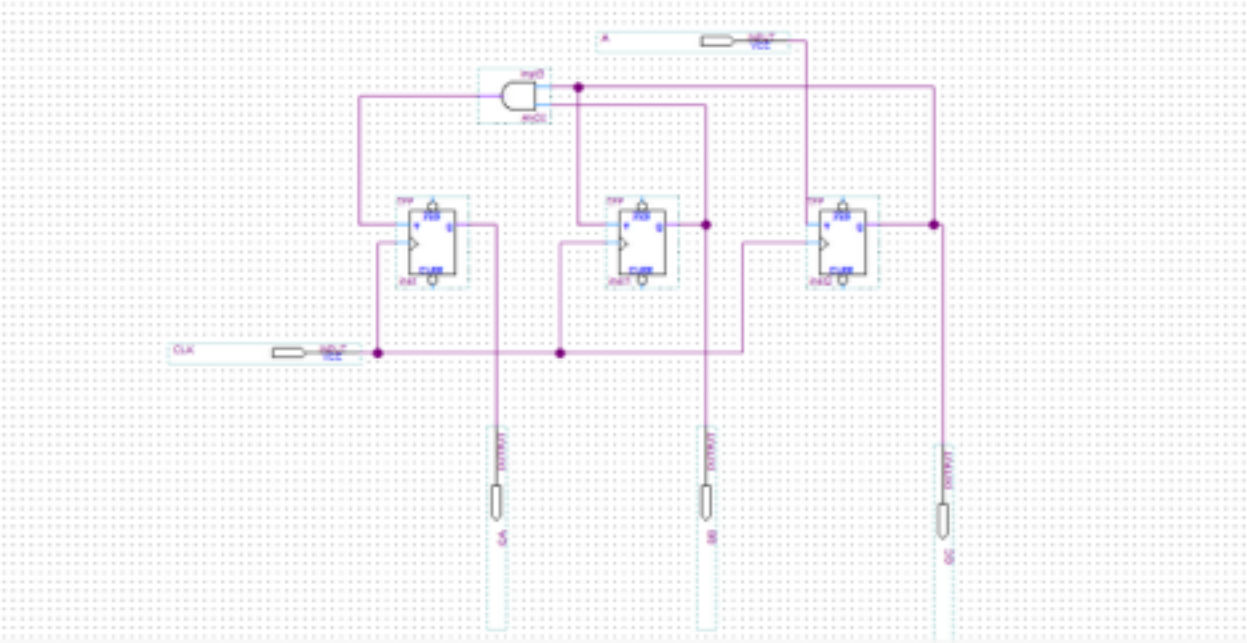
EXPRESSION:

TA= BC

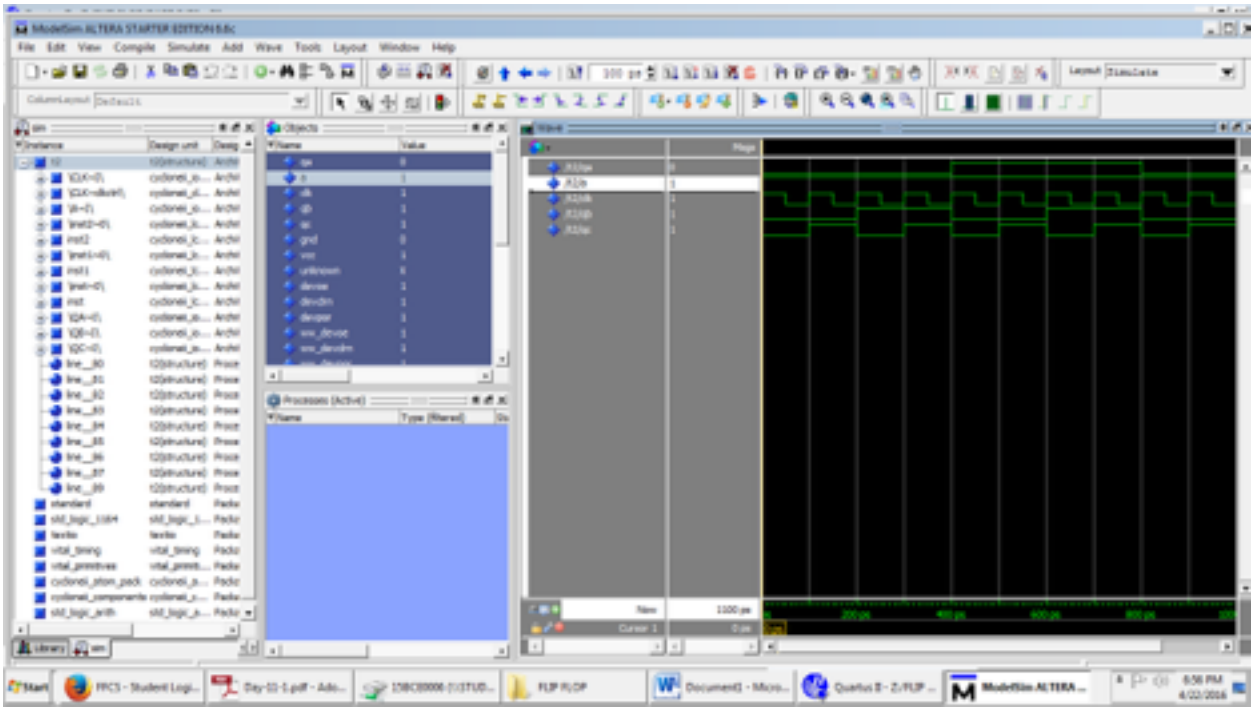
TB= C

TC=1

CIRCUIT DIAGRAM:



WAVEFORM:



PART C:

AIM:

Design the control circuit for a vending machine with the following specifications:

a. The vending machine accepts 5-rupee coin and 10-rupee coin.
b. When the machine has received 10 rupees it delivers a package of candy.
c. If too much money has been added, the machine returns the difference.
d. Candy will not be released if sufficient money is not added.
e. When the candy has been released, the release mechanism brings the circuit back to the original, starting state**.**

TRUTH TABLE:

X	Y	Qt	Qt+1	A	B	C	TA
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	0	0	1	0
0	1	1	0	0	1	1	1
1	0	0	1	0	0	0	1
1	0	1	0	0	0	1	1
1	1	0	0	0	1	1	0
1	1	1	0	1	0	1	1

EXPRESSION:

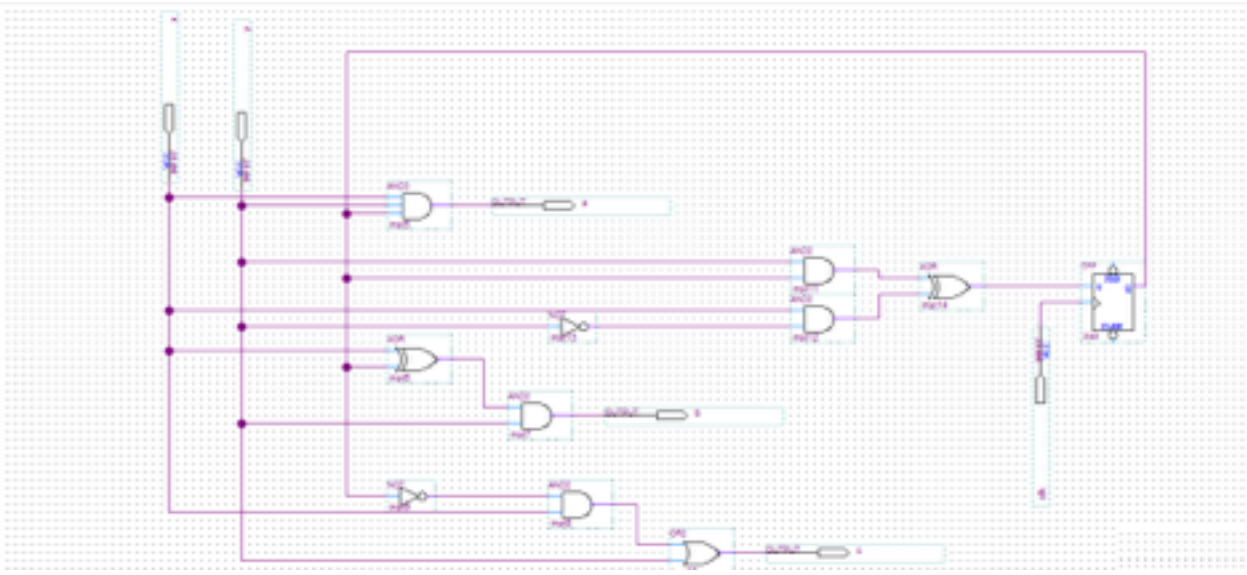
TA= YQt+ XY’

A= XYQt

B= Y[X XOR Qt]

C= Y + XQt’

CIRCUIT DIAGRAM:



WAVEFORM: