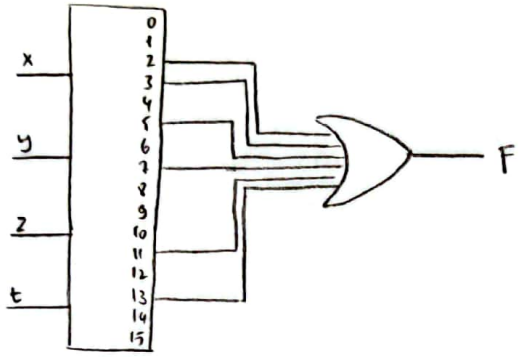
CS303 Homework 3 - Elif Cenre Durgut

Q1: $F = \Sigma(2,3,5,7,11,13)$

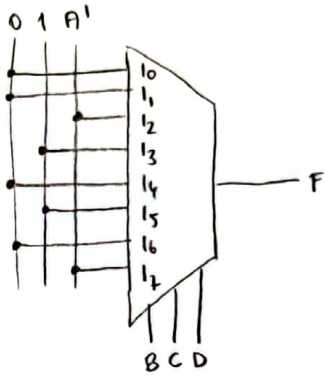
0010 0011 0101 0111 1011 1101

a) Using a 4x16 decoder:



b)

	I_0	I_1	I_2	I_3	I_4	I_5	I_6	I_7
A'	0	1	(2)	(3)	4	(5)	6	(7)
A	8	9	10	(11)	12	(13)	14	15
	0	0	A'	1	0	1	0	A'

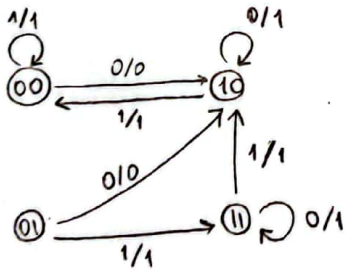


Q2:

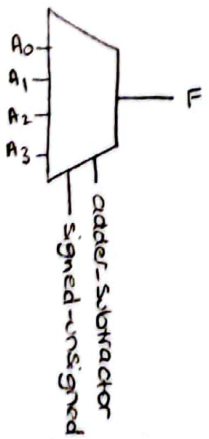
a)

Present state		input	Next state		output
A	B	x	A(t+1)	B(t+1)	y
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	1	0	0
0	1	1	1	1	1
1	0	0	1	0	1
1	0	1	0	0	1
1	1	0	1	1	1
1	1	1	1	0	1

b)



Q3: We need to use multiplexer to decide:



A_0: result of signed adder

A_1: " " signed subtractor

A_2: " " unsigned adder

A_3: " " unsigned subtractor

Q4:

a)

$F1 = CA + C'B$

$F2 = (B')'.F1 = BF1$

$F3 = B'F1' + B'F1$

$F = (A')'C + A'F3 = AC + A'F3$

b)

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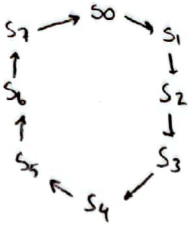
always @ (A or B or C);
begin
   if (A==1 & C==1) F=1;
   else F=0;
end
```

Q6: i) state diagram



ii) state assignment

S_0 : 000
S_1 : 001
S_2 : 011
S_3 : 010
S_4 : 110
S_5 : 111
S_6 : 101
S_7 : 100

iii) state table

present			next			counter		
A_2	A_1	A_0	A_2	A_1	A_0	D_0	D_1	D_2
0	0	0	0	0	1	0	0	1
0	0	1	0	1	1	0	1	1
0	1	1	0	1	0	0	1	0
0	1	0	1	1	0	1	1	0
1	1	0	1	1	1	1	1	1
1	1	1	1	0	1	1	0	1
1	0	1	1	0	0	1	0	0
1	0	0	0	0	0	0	0	0

$D_0 = \Sigma(3,4,5,6)$

$D_1 = \Sigma(1,2,3,4)$

$D_2 = \Sigma(0,1,4,5)$

iv) K-maps

A_2 \ A_1A_0	00	01	11	10
0	0	0	0	1
1	0	1	1	1

$D_0 = A_2A_0 + A_1A_0'$

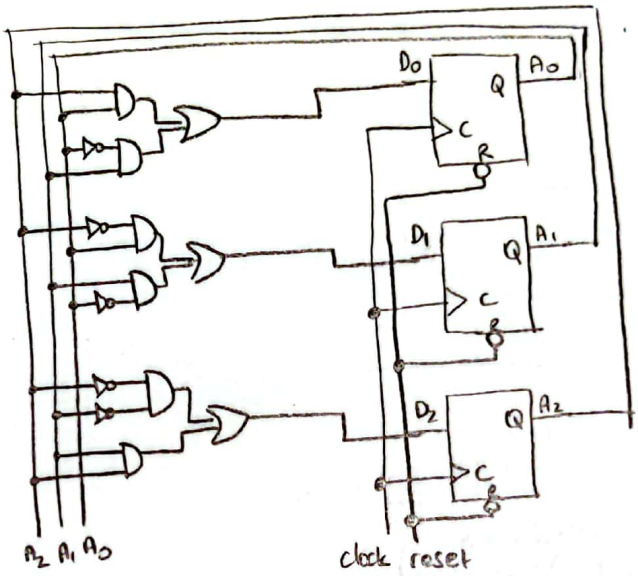
A_2 \ A_1A_0	00	01	11	10
0	0	1	1	1
1	0	0	0	1

$D_1 = A_2'A_0 + A_1A_0'$

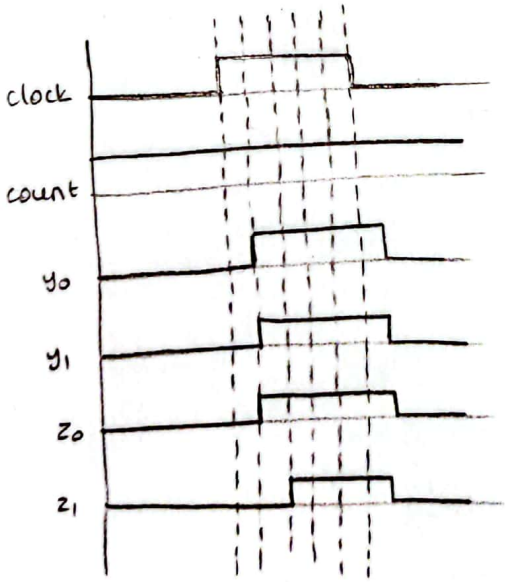
A_2 \ A_1A_0	00	01	11	10
0	1	1	0	0
1	0	0	1	1

$D_2 = A_2'A_1' + A_2A_1$

v) Diagram



Q9:



Q7:

The output of the first multiplexer: $(C')'A + C'A' = CA + C'A'$

" " " " second " : $A'C' + AC$

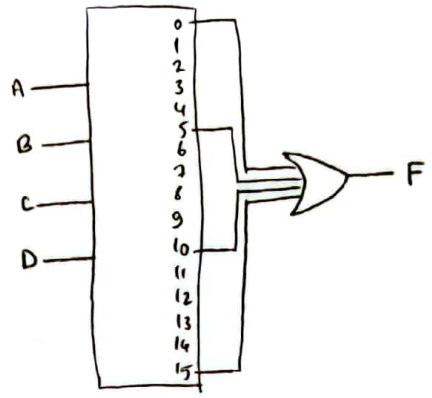
$F = D'B'I_0 + D'BI_1 + DB'I_2 + DBI_3$

$= D'B'(CA + C'A') + D'B + DB' + DB(A'C' + AC) = (A'C' + AC)(DB + D'B') = (A \overline{\oplus} C)(D \overline{\oplus} B) \Rightarrow$ when A = C and B = D

A	B	C	D	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

$F = A'BC'D + A'B'C'D' + ABCD + AB'CD'$

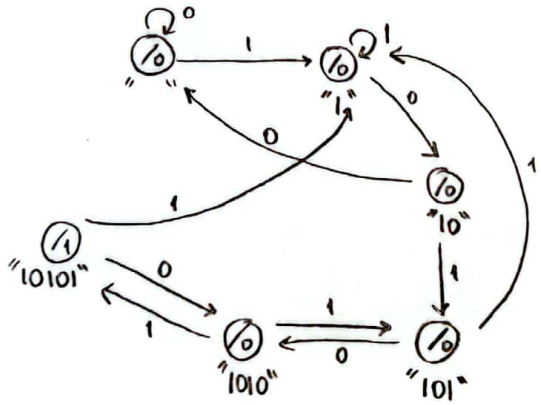
$= \sum(5, 0, 15, 10)$



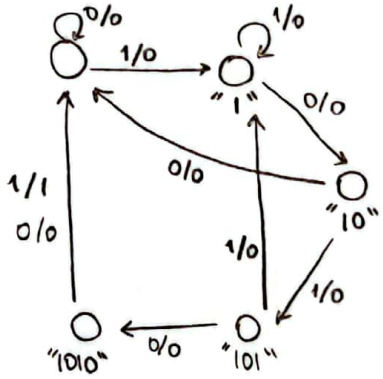
Q11: The question says "10101" contains two "101", this means there's overlap.

bir edge üzerinde iki geçiş var??

a)

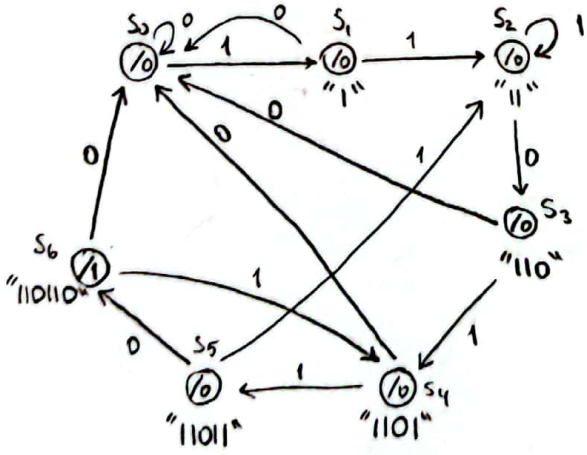


b)



Q10: 110110 detector: (I assumed that overlapping is allowed.)

a)



b)

present $A_2\ A_1\ A_0$	input x	next $A_2\ A_1\ A_0$	output y
0 0 0	0	0 0 0	0
0 0 0	1	0 0 1	0
0 0 1	0	0 0 0	0
0 0 1	1	0 1 0	0
0 1 0	0	0 1 1	0
0 1 0	1	0 1 0	0
0 1 1	0	0 0 0	0
0 1 1	1	1 0 0	0
1 0 0	0	0 0 0	0
1 0 0	1	1 0 1	0
1 0 1	0	1 1 0	0
1 0 1	1	0 1 0	1
1 1 0	0	0 0 0	0
1 1 0	1	1 0 0	0