BIRZEIT UNIVERSITY

Faculty of Engineering and Technology
Electrical and Computer Engineering Department
ENCS3310-Advanced Digital Design First Semester 2023/2024

HW#3

Q1) 45 points

a) Show the primitive flow table for a positive edge D Flip-Flop. [12 points]

b) Assign output values to the don't care states in the following flow table in such a way as to avoid transient output pulses. ***[4 points]***

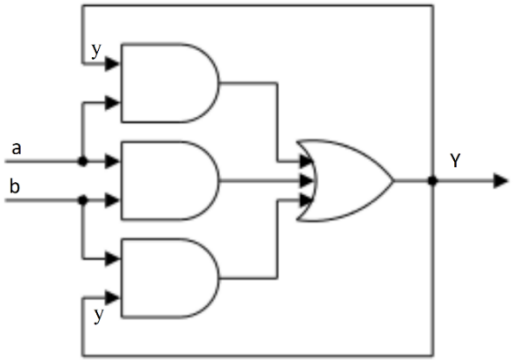
	00	01	11	10
a	(a),0	b , -	- , -	d , -
b	a , -	(b), 1	(b), 1	c , -
c	b , -	- , -	b , -	(c), 0
d	c , -	(d), 1	c , -	(d), 1

	00	01	11	10
a				
b				
c				
d				

c) Given the following primitive flow table, draw the reduced flow table after reducing the number of states. **[14 points]**

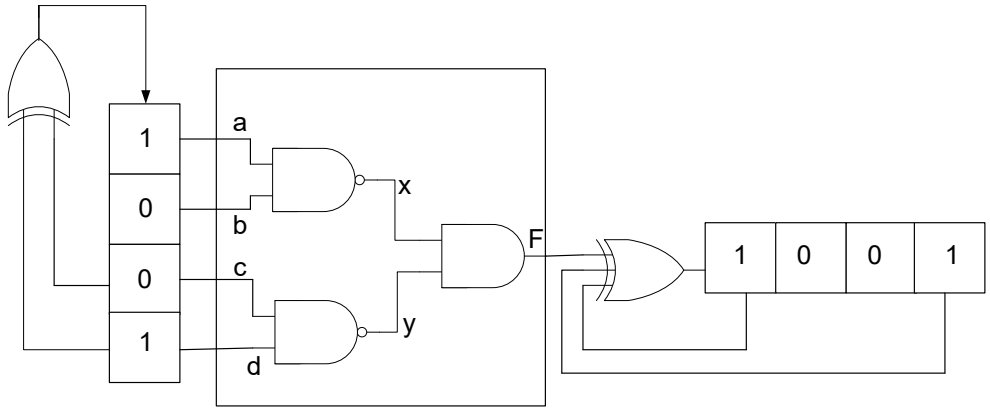
	00	01	11	10
a	ⓐ , 0	b , -	-, -	d , -
b	a , -	ⓑ , 0	c , -	-, -
c	-, -	b , -	ⓒ , 0	h , -
d	e , -	-, -	g , -	ⓓ , 1
e	ⓔ , 1	f , -	-, -	d , -
f	e , -	ⓕ , 1	g , -	-, -
g	-,-	f , -	ⓖ , 1	h , -
h	a , -	-, -	c , -	ⓗ , 0

d) i) Show the transition table for the following circuit. **[5 points]**
ii) Implement the same circuit using SR-latch. **[10 points]**



Q2) (33 points)

The following Figure shows a circuit with 4 inputs (a,b,c,d) , one output (F) and 2 internal nodes (x,y). An LFSR will be used to generate test vectors and an SISR will be used for result analysis. The initial value for the LFSR and SISR are "1001" as shown in the Figure . Answer the following questions



a. Use Boolean Difference to find all the test vectors for b sa0 and b sa1. [7 points]

b. Use D-algorithm to find all test vectors for y sa0 and y sa1. [6 points]

c. If we want to generate 6 test vectors including the initial vector. Then show these 6 test vectors that are generated by the LFSR. ***[4 points]***

d. What is the fault coverage achieved by these test vectors. Show how you get this result***.[6 points]***

	Faults ---------- Test Vector	a/0	a/1	b/0	b/1	c/0	c/1	d/0	d/1	x/0	x/1	y/0	y/1	F/0	F/1
1	1001														
2															
3															
4															
5															
6															

Fault Coverage =

e. What is the fault free signature that will be stored in the SISR after applying these test vectors to the circuit***? [6 points]***

f. Assume that node x is sa1, what is the signature that will be stored in the SISR after applying these 6 test vectors to the circuit. ***[4 points]***