Homework 5 Solution

Q1. (6 points)

For each sub-question: correct: 1, incorrect: 0.5, no answer: 0.

For the K-map, there can be all different representations. So, as long as the equation is equivalent, mark it as correct.

1) A truth table for Full-Adder

x	y	z	s	c
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

2) K-map for S

	1		1
1		1	

$S = \sim x \sim yz + \sim xy \sim z + xyz + x \sim y \sim z$

3) K-map for C

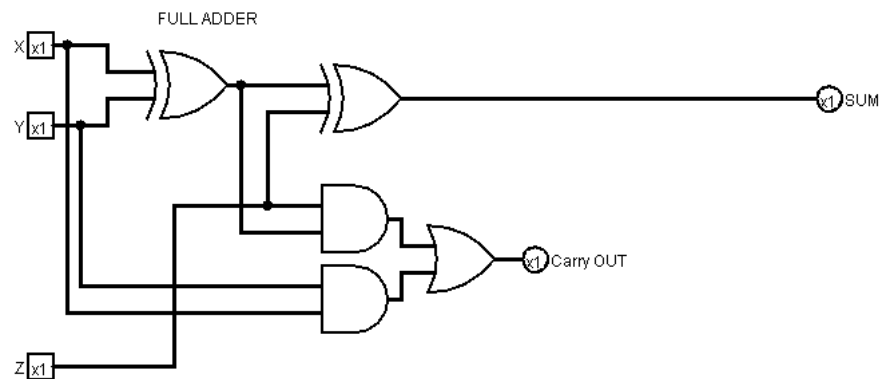|		1	
	1	1	1

$C = xy + yz + xz$

4) $S = \sim x \sim yz + \sim xy \sim z + xyz + x \sim y \sim z$
   $= \sim x(\sim yz + y \sim z) + x(yz + \sim y \sim z)$
   $= \sim x(y \text{ XOR } z) + x \sim(y \text{ XOR } z)$
   $= x \text{ XOR } y \text{ XOR } z$

5) $C = xy + yz + xz$
   $= xy + yz(x + \sim x) + xz(y + \sim y)$
   $= xy + xyz + \sim xyz + xyz + x \sim yz$
   $= xy + \sim xyz + x \sim yz$
   $= xy + (x \text{ XOR } y)z$

FULL ADDER

Q2. (6 points)

2) Complete the following truth table for the following sequential circuit:

X	Y	Carry-in (or Q before clock)	S (before clock)	Carry-out (before clock)	S (after clock)	Carry-out (after clock)
0	0	0	0	1	1	1
0	0	1	1	1	1	1
0	1	0	1	1	0	0
0	1	1	0	0	1	1
1	0	0	1	1	0	0
1	0	1	0	0	1	1
1	1	0	0	0	0	0

| 1	1	1	1	0	0	0

Q3. (4 points)

1) (2 points) Draw the logic diagram of the circuit and test it with Logisim. Copy and paste the circuit image and report the test result. (Attach the circuit file separately)

If image and circuit exist and are correct: 2, incorrect: 1, no file or image: 0
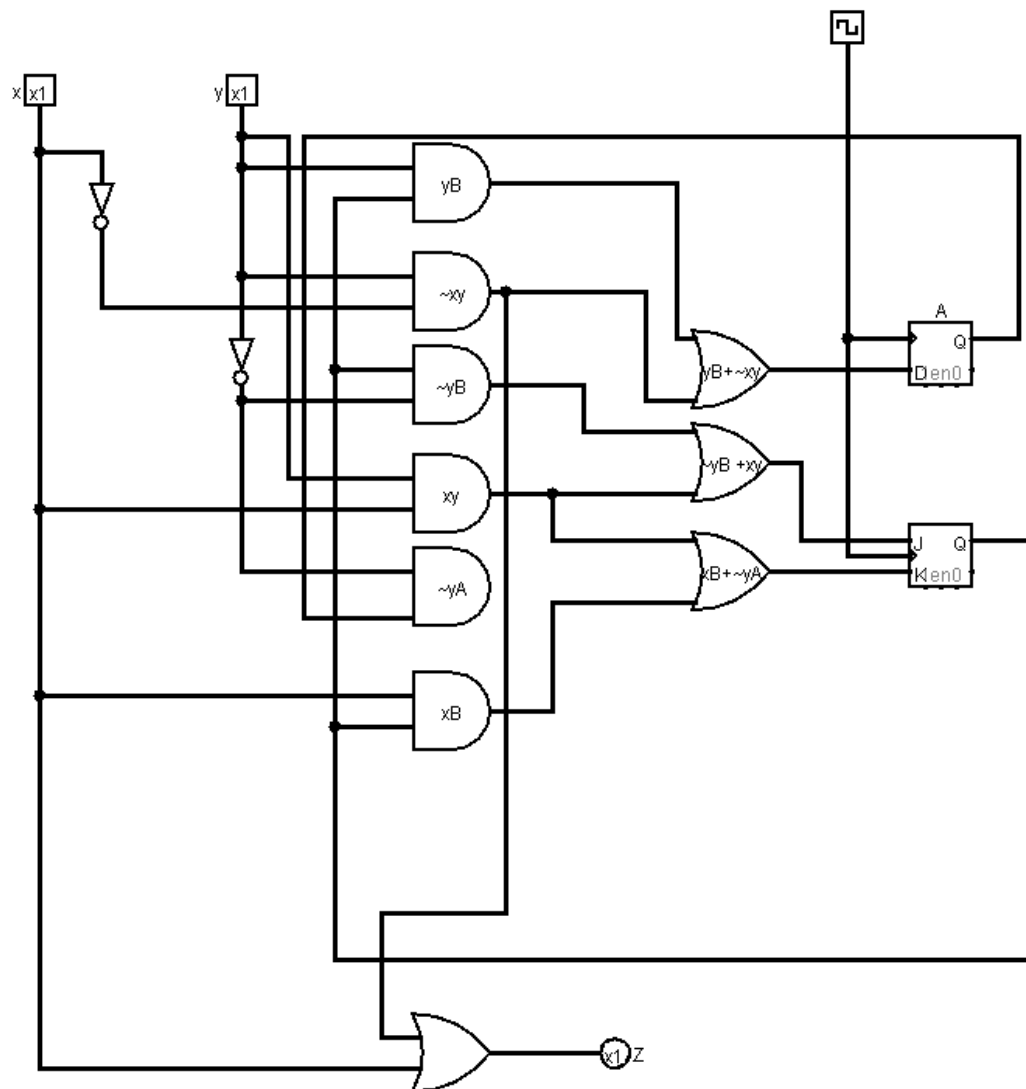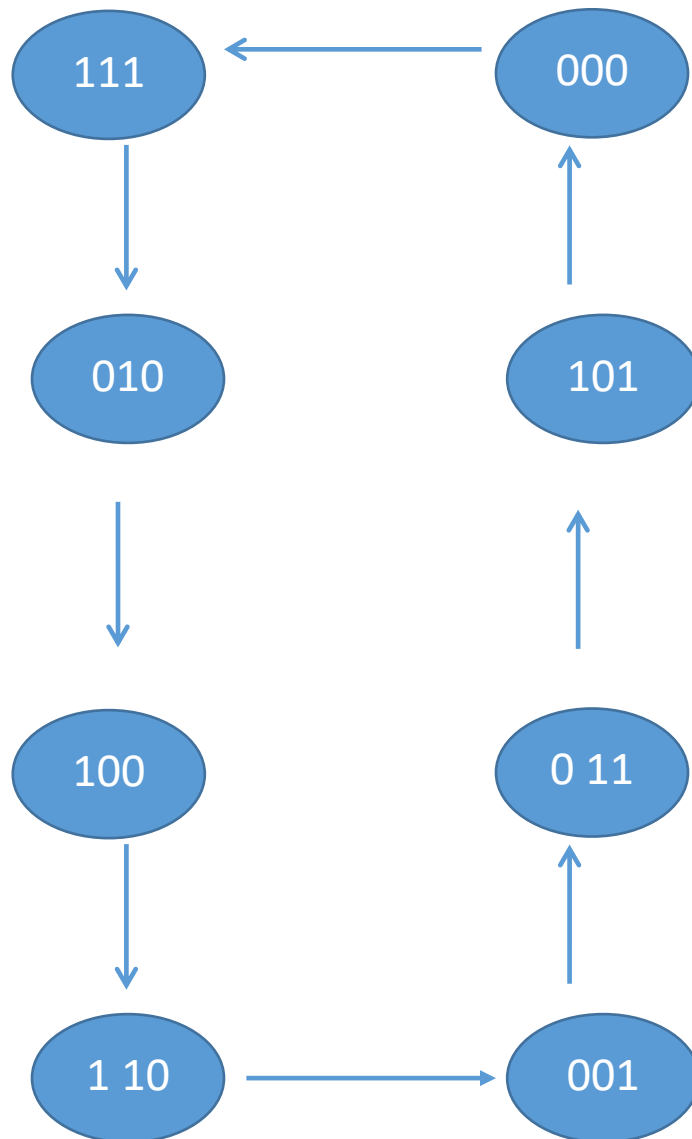
2) **(2 points)** If correct: 2, 1~4 mistakes: 1, more than 4 mismatches: 0.5, no diagram: 0

****took off "0.5" point each for missing input or missing output.
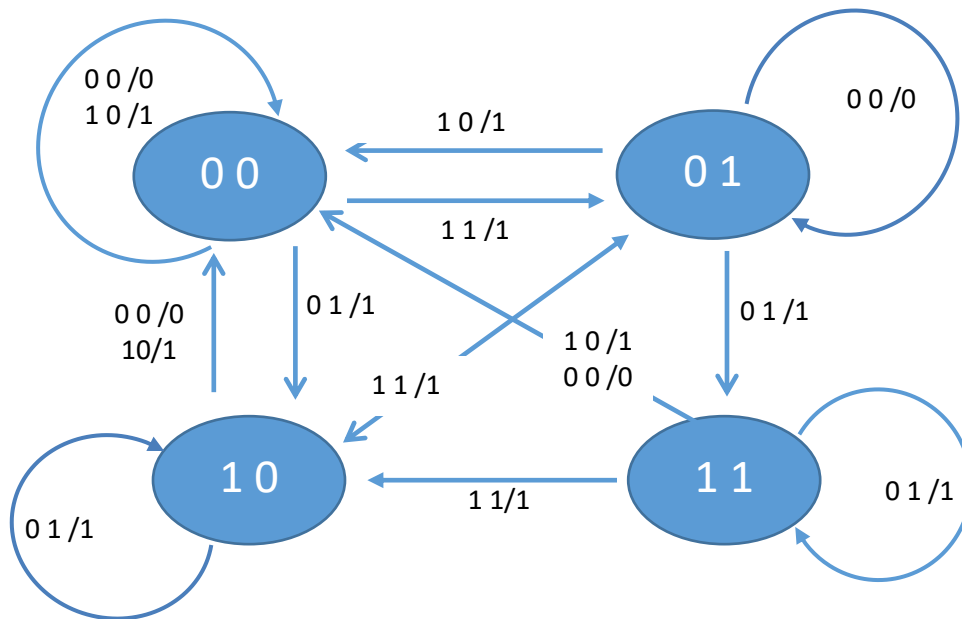
Q4. (10 points)

1) Draw a state diagram: If correct: 2, incorrect: 1, No answer: 0

2) Construct an excitation table If correct: 2, incorrect: 1, No answer: 0

A	B	C	A_{t+1}	B_{t+1}	C_{t+1}	J_a	K_a	J_b	K_b	J_c	K_c
0	0	0	1	1	1	1	x	1	x	1	x
0	0	1	0	1	1	0	x	1	x	x	0
0	1	0	1	0	0	1	x	x	1	0	x
0	1	1	1	0	1	1	x	x	1	x	0
1	0	0	1	1	0	x	0	1	x	0	x
1	0	1	0	0	0	x	1	0	x	x	1
1	1	0	0	0	1	x	1	x	1	1	x
1	1	1	0	1	0	x	1	x	0	x	1

3) Draw K-maps and derive Boolean equations using K-maps. Make the equations as simple as possible (If correct: 2, incorrect: 1, No answer: 0)

	~A~B	~A B	AB	A~B
~C	1	1	x	x
C		1	x	x

Ja = B+~C

	~A~B	~A B	AB	A~B
~C	x	x	1	
C	x	x	1	1

Ka =B+C

	~A~B	~A B	AB	A~B
~C	1	x	x	1
C	1	x	x	

$Jb = {\sim}A + {\sim}C$

	~A~B	~A B	AB	A~B
~C	x	1	1	x
C	x	1		x

$Kb = {\sim}A + {\sim}C$

	~A~B	~A B	AB	A~B
~C	1		1	
C	x	x	x	x

$Jc = {\sim}A{\sim}B + AB$

	~A~B	~A B	AB	A~B
~C	x	x	x	x
C			1	1

$Kc = A$
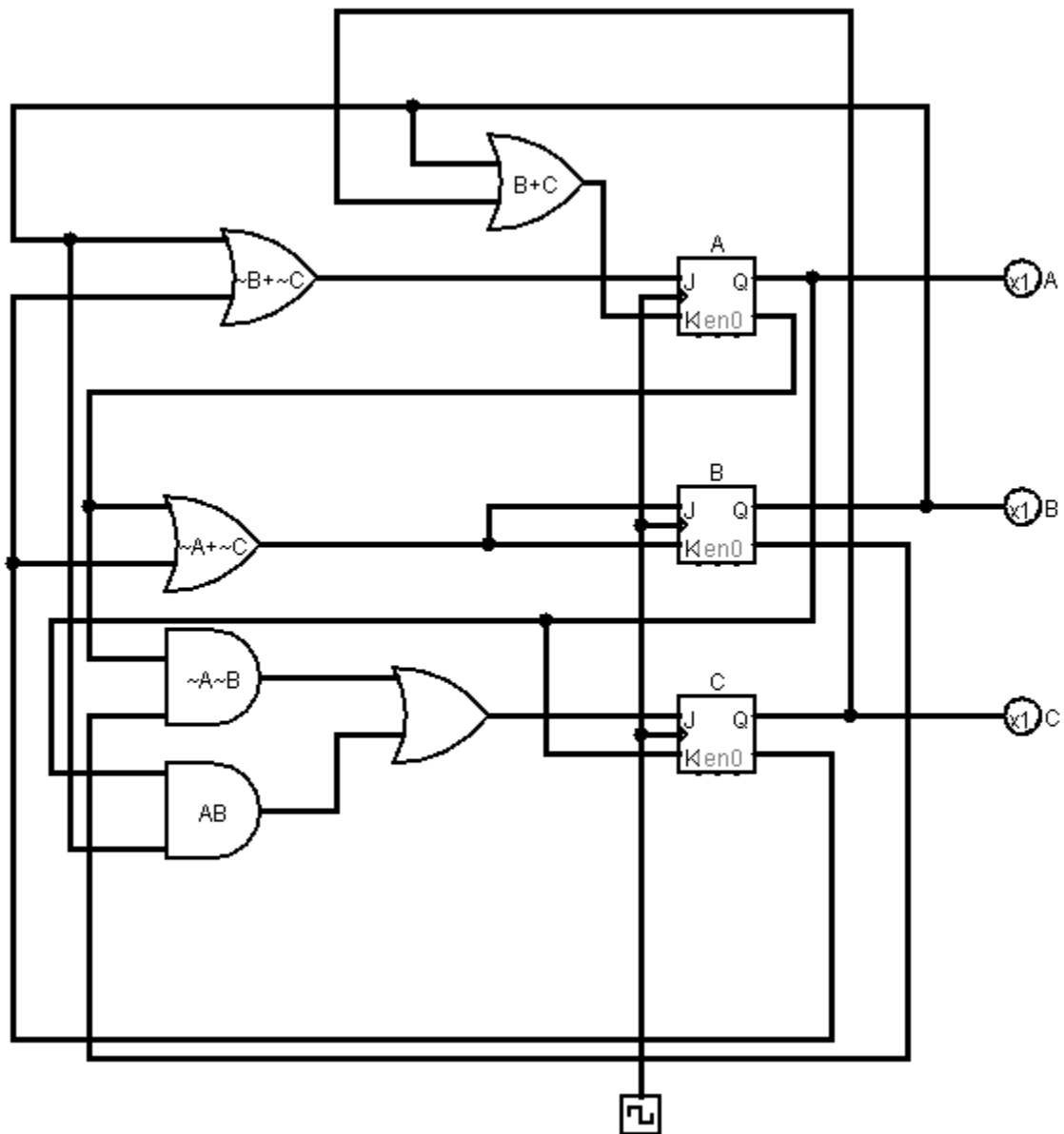
Q5. (2 points)

1) Suppose you want to write a data 1 0 1 to the word 3 (address 3). Give the correct values of S1, S0, Bit2, Bit1, Bit0, ~WE, reset, for this task, and test it with the circuit.

RESET	S1	S0	Bit2	Bit1	Bit0	~WE
0	1	1	1	0	1	1

Correct: 1, Incorrect: 0.5, No answer: 0.

2) Suppose you want to read a data from the address 1. Give the correct values of S1, S0, Bit2, Bit1, Bit0, ~WE, reset, for this task.

RESET	S1	S0	Bit2	Bit1	Bit0	~WE
0	0	1	x	x	x	0

Correct: 1, Incorrect: 0.5, No answer: 0.