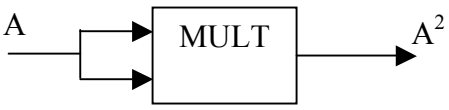
CPRE 281 – Solutions to Mock Exam #2

1. (a) i) 10 ii) –13
   (b) i) 01010 ii) 11011
   (c) i) 10110 ii) 01101
   (d)

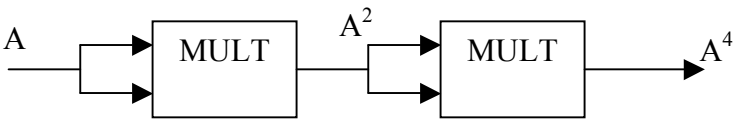
010000	111110	000000
01000	10001	10001
+01000	+11111	-10000
10000	10000	00001
overflow		

2. $-4.625 \times 2^9 = -100.101 \times 2^9 = -1.00101 \times 2^{11}$
   $11 + 127 = 138 = 10001010_2$
   IEEE format: 1 10001010 00101000000000000000000

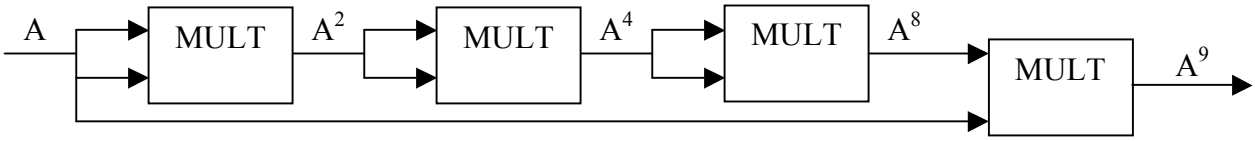
3. (a)



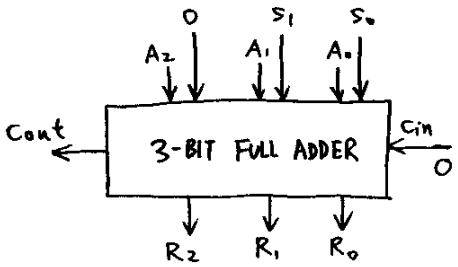
   (b)



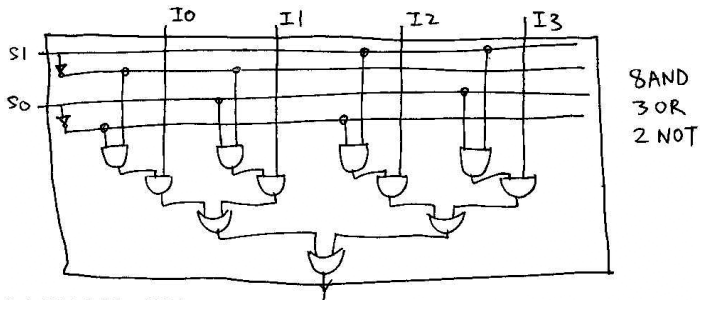
   (c) Similar to (b), we can use three ADD blocks in a sequence to compute 8*A.
   (d)



4.

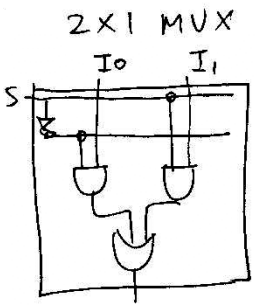


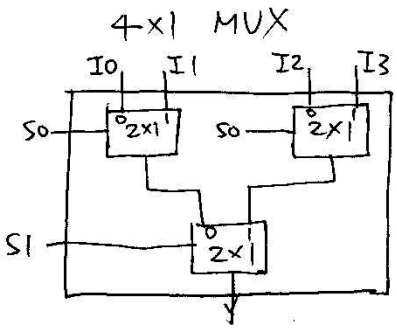
5. (a)



(b) 8 AND, 3 OR , 2 NOT

(c)

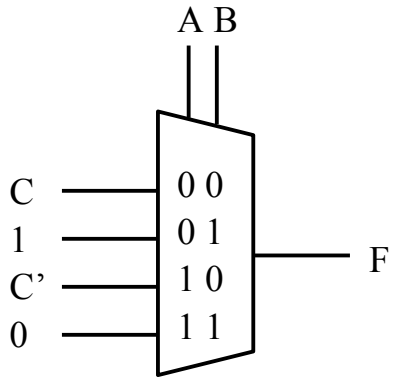




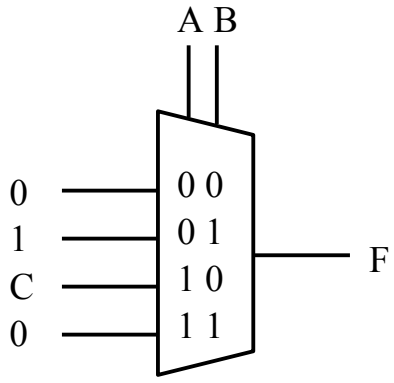
(d) 6 AND, 3 OR, 3 NOT

(e) The design of (c) uses less gates.

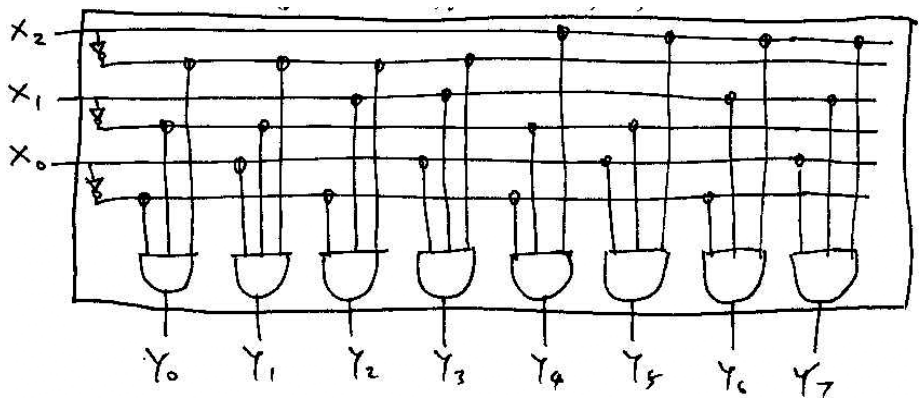
6. (a)



(b) F(0,0,C) = 0
F(0,1,C) = 1
F(1,0,C) = C
F(1,1,C) = 0
So F = A'.B'.0 + A'.B.1 + A.B'.C + A.B.0



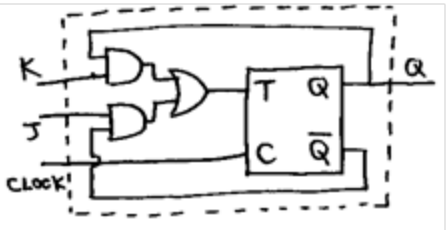
7.



8. (a)

J	K	Next Q	T
0	0	Q	0
0	1	0	Q
1	0	1	$\overline{Q}$
1	1	$\overline{Q}$	1

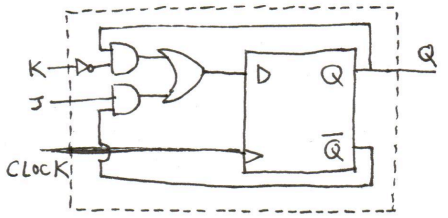
So $T = KQ + J\overline{Q}$



(b)

J	K	Next Q	D
0	0	Q	Q
0	1	0	0
1	0	1	1
1	1	$\overline{Q}$	$\overline{Q}$

So $D = \overline{K} \cdot Q + J\overline{Q}$



Solutions to Extra Exercises

1. (a) 9 bits (b) 9 bits (c) 3 bits

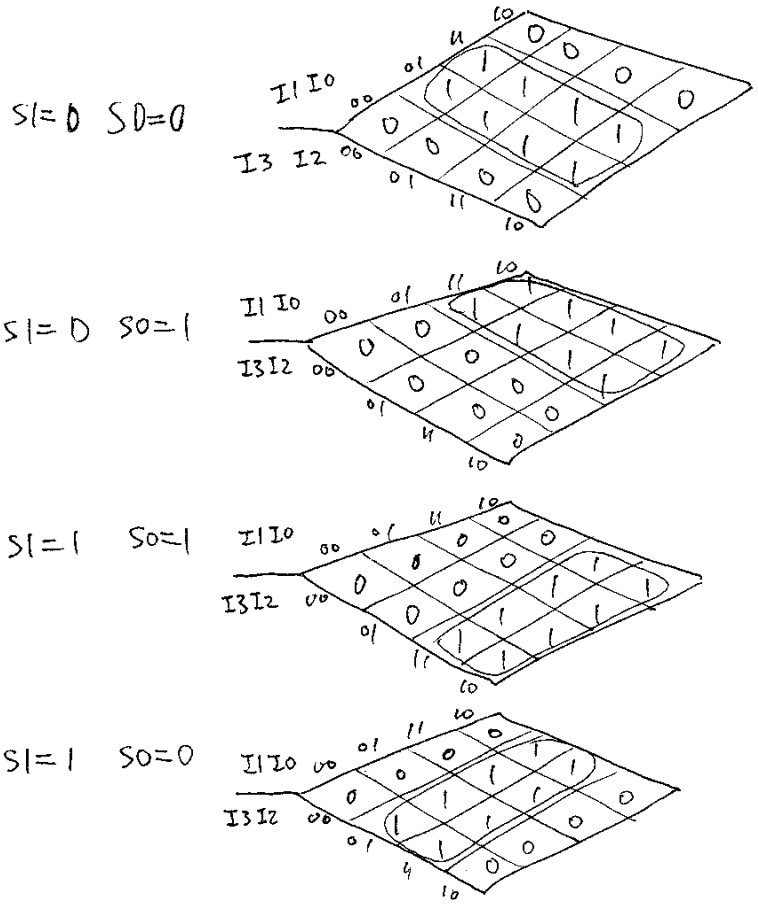
2. (a) 6 trits (b) 6 trits (c) 2 trits

3. (a) 0 to 1023 (b) –511 to 511 (c) –511 to 511 (d) –512 to 511

4. (a) Cannot be represented.
   (b) 110011
   (c) 101100
   (d) 101101

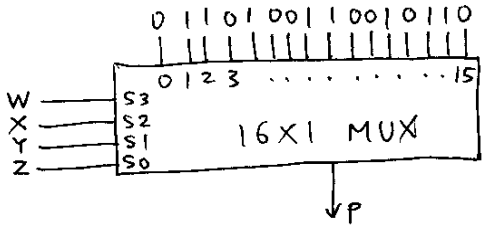
5. (a) You can find the uncompact truth table in Lec. 21 slide 4.

   (b)



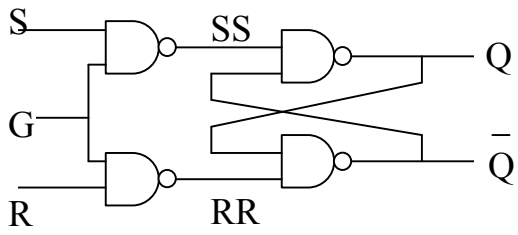
   (c) F = S1 S0 I3 + S1 S0' I2 + S1' S0 I1 + S1' S0' I0
   (d) The same expression as (c). The expression is also given in Lec. 21 slide 5.

6.



7. The design can be found in Lec. 22 slide 17. The details are not given.

8.



G	S	R	SS	RR	Next state
0	0	0	1	1	NC
0	0	1	1	1	NC
0	1	0	1	1	NC
0	1	1	1	1	NC
1	0	0	1	1	NC
1	0	1	1	0	Q=0
1	1	0	0	1	Q=1
1	1	1	0	0	U

9. The design can be found in Lec. 28 slide 5.