

Student ID Number: _____ (no names please)

Work all problems (13 questions)

1. (8 pts) Plot the following function on a K-Map.

$$F(A,B,C,D) = ABC' + A'D'$$

PLOT ONES.

		AB			
		00	01	11	10
CD	00	1	1	1	
	01			1	
	11				
	10	1	1		

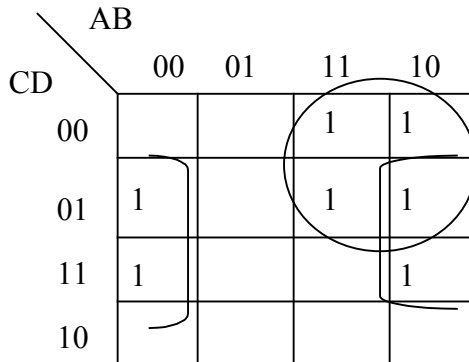
2. (8 pts) Plot the following function on a K-Map.

$$F(A,B,C,D) = \prod M(1,4,5,8,11,14,15)$$

PLOT ZEROS.

		AB			
		00	01	11	10
CD	00		0		0
	01	0	0		
	11			0	0
	10			0	

3. (8 pts) Simplify the following K-map to get a **minimal SOP** form.

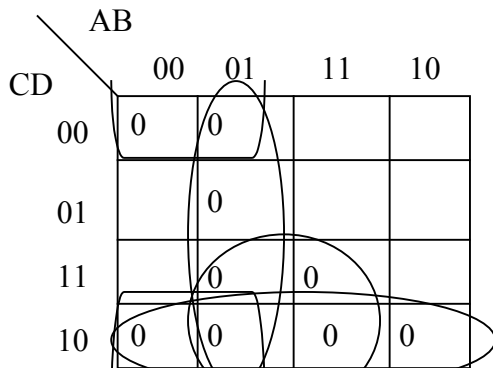


$$F = AC' + B'D$$

4. (8 pts) Simplify the following K-Map to get a **minimal POS** form.

$$F' = A'D' + A'B + BC + CD'$$

$$F = (A+D)(A+B')(B'+C')(C'+D)$$



5. (8 pts) On the diagram below, I want Y to be asserted (LOW TRUE) when either switch is depressed. Draw the Gate(s) that I need. Be sure to list the GATE NUMBERS (i.e. 7400, 7402, etc).

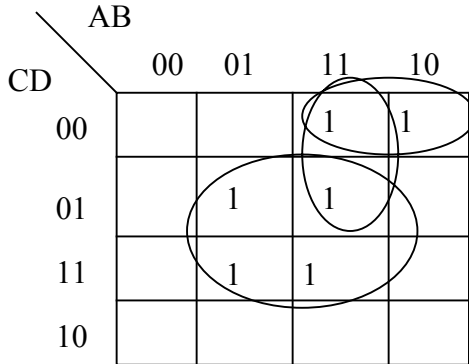
Original Diagram had a low true switch(B) OR'ed with a HIGH TRUE switch (A) to get a low true output..

Need either a 7404 on B switch combined with a 7402 gate.

OR a 7404 on A switch combined with a 7408 gate.

6. (9 pts) On the following map, identify the following (give the product term):

- a. PRIME IMPLICANT BD
- b. ESSENTIAL PRIME IMPLICANT BD
- c. NON-ESSENTIAL Prime Implicant. ABC'



7. (5 pts) a. What sized memory device (K x M) would be needed to implement your SSN decode lab?
 F1, F2, F3, F4 each a function of the same four variables (A,B,C,D) 16 x 4

b. (5 pts) What kind of boolean equations is a memory device **inefficient** at implementing?
 Functions with many variables, multiple functions that do not share the same variables.

8. (5 pts) On the attached PLD diagram (Figure 1), explain what function is implemented according to the fuse marking? Give the SOP form for Y' !!!!

$$Y' = A'DJ'E + FG + C'$$

9. (5 pts) Write the following function in SOP form using the minterms indicated. Do NOT minimize.

$$F(A,B,C,D) = \sum m(2, 7, 11) = A'B'CD' + A'BCD + AB'CD$$

10. (5 pts) Write the following function in POS form using the maxterms indicated. Do NOT minimize.

$$F(A,B,C,D) = \prod M(2, 7, 11) = (A+B+C+D)(A+B'+C'+D')(A'+B+C'+D')$$

11. a.(5 pts) In class, I made the statement "Minimization is technology dependent". What does this mean? Give an example using the PAL shown in Figure 1.

The PAL has only 4 product terms per output. Does not do any good to minimize an equation to use less than 4 product terms.

b. (5 pts) Minimization is aimed at reducing 'resource' usage in an implementation technology. Name two 'resources' in a PAL that minimization should try to conserve.

INPUTS, OUTPUTS, Product terms (equations must have no more than 4).

12. (8 pts) Plot the following function on the K-MAP shown

$$F(A, B, C, D) = A \text{ xor } B \text{ xor } C$$

Create TRUTH TABLE, then plot on map.

		AB			
		00	01	11	10
CD	00		1		1
	01		1		1
	11	1		1	
	10	1		1	

A	B	C	D	A xor B xor C
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

13. (8 pts) Minimize the following K-Map to an SOP form:
 $B'D' + ABC'D + A'BCD$

		AB			
		00	01	11	10
CD	00	1			1
	01		1		
	11		1		
	10	1			1