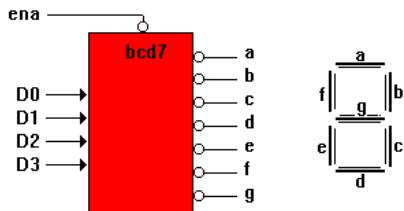


## Karnaugh Map and circuit designing

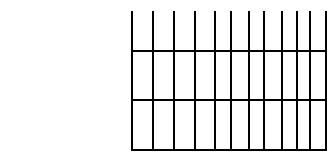
*All lab work must be initiated and completed during the lab hours.*

*Only when additional time is required, student may submit the uncompleted draft of the lab during the lab and improve the lab work within 24 hours with 20% off.*

- 1) Binary to 7-segment decoder is a combinational circuit that converts a binary number to decimal digit. The 7 outputs of the decoder (a, b, c, d, e, f, g) selects the corresponding segments in the displays shown in part A below. The numeric display chosen to represent the decimal digit is shown in part B below. The 6 invalid combinations should result in blank display. Design a Binary to 7 segment decoder circuit with using minimum number of the gates..



Inputs		outputs								
A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	1	0	0	1	0	1	0
0	0	0	1	0	1	0	1	0	0	1
0	0	1	0	0	0	1	0	1	0	0
0	0	1	1	0	0	0	1	1	0	1
0	1	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0
0	1	1	0	0	0	0	0	1	0	0
0	1	1	1	0	0	0	0	1	0	1
1	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0	1	0
1	0	1	0	0	0	0	0	1	0	0
1	0	1	1	0	0	0	0	1	0	1
1	1	0	0	0	0	0	0	0	0	0
1	1	0	1	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	1	0	0
1	1	1	1	0	0	0	0	1	0	1



A	B	C	D	a	b	c	d	e	f	g	
0	0	0	0	1	1	1	1	1	1	0	0
0	0	0	1	0	1	1	0	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1	
0	0	1	1	1	1	1	1	0	0	1	
0	1	0	0	0	1	1	0	0	1	1	
0	1	0	1	1	0	1	1	0	1	1	
0	1	1	0	1	1	1	1	1	0	1	
0	1	1	1	1	1	1	1	0	0	0	
1	0	0	0	1	1	1	1	1	1	1	
1	0	0	1	1	1	1	0	0	1	1	
1	0	1	0								
1	0	1	1								
1	1	0	0								
1	1	0	1								
1	1	1	0								
1	1	1	1								

0  
1  
2  
3  
4  
5  
6  
7  
8  
9

7

$$b'cd' + \alpha'b'CD + \alpha'BCd' +$$

$$'BCD + Ab'c'd' + Ab'c'D$$

a

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

$$A'C + AB'C' + A'BD + A'B'D' + B'C'D'$$

$$A'B'C'D' + A'B'C'D + A'B'CD' + A'B'CD + A'BC'D' + A$$

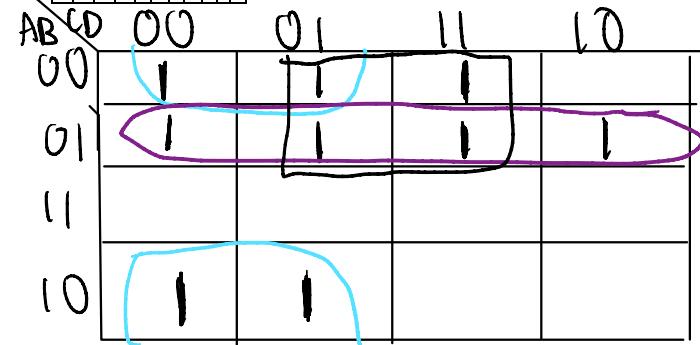
$$+ A'BCD + AB'C'D + AB'C'D$$

b

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

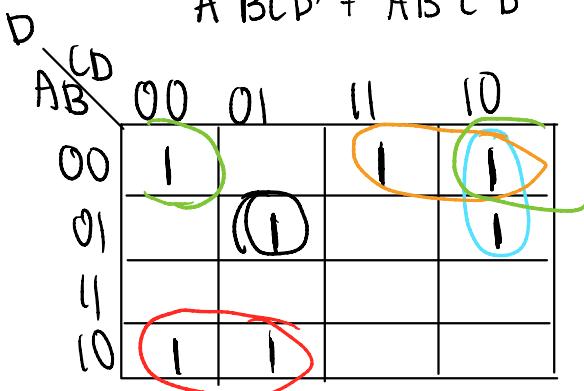
$$A'B' + A'CD + A'C'D' + B'C'$$

$$A'B'C'D' + A'B'C'D + A'B'CD + A'BC'D' + \\ A'BC'D + A'BCD' + A'BCD + AB'C'D' + \\ AB'C'D$$



$$B'C' + A'B + A'D$$

$$A'B'C'D' + A'B'CD' + A'B'CD + A'BC'D + \\ A'BCD' + AB'C'D'$$



$$A'BC'D + \boxed{AB'C'} + \boxed{A'CD'} + \boxed{A'B'C} + \boxed{A'B'D'}$$


$$A'B'C'D' + A'B'CD' + A'BCD' + AB'C'D'$$

E

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

$$B'C'D' +$$

$$A'CD'$$

F

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

$$AB'C' +$$

$$A'C'D' +$$

$$A'BC' +$$

$$A'BD'$$


G

AB	CD	00	01	11	10
00					
01					
11					
10					

$$A'B'C' +$$

$$AB'C' +$$

$$A'BC' +$$

$$A'CD'$$