2012 Midterm

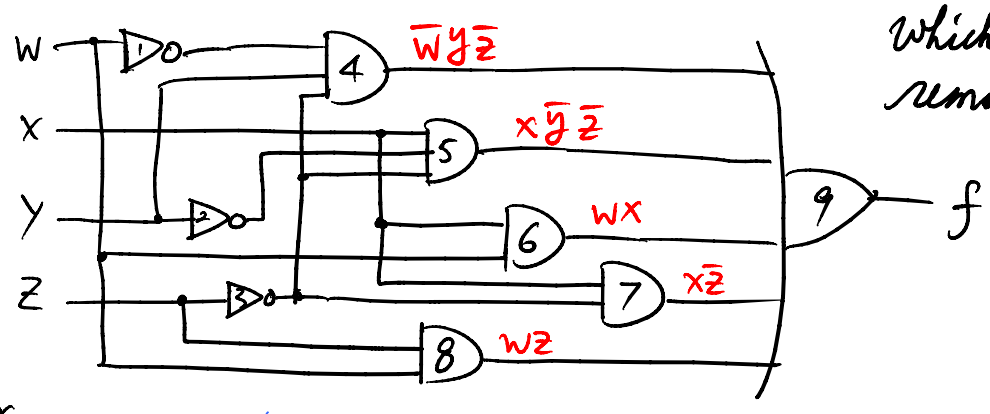
Q1. Boolean Algebra

i) $f = \bar{a}d + ad + b\bar{c}d + \bar{a}b\bar{c}\bar{d} + ab\bar{c}\bar{d}$

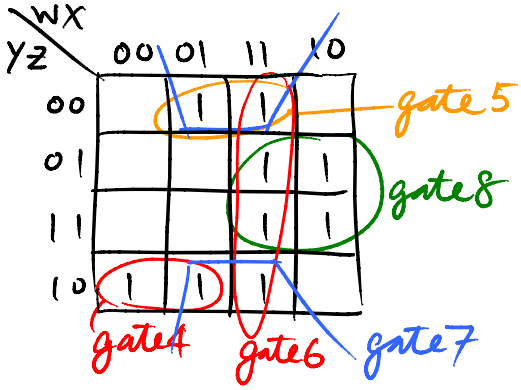
$= d + b\bar{c}d + b\bar{c}\bar{d}$ (combining)

$= d + b\bar{c}$ (combining)

Q2.



Which gates can be removed?



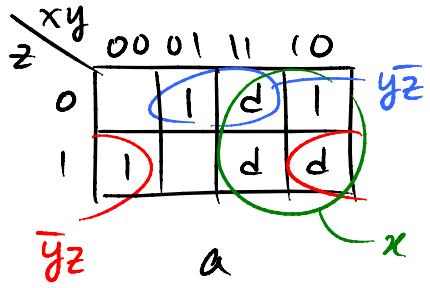
minimal SOP cover is

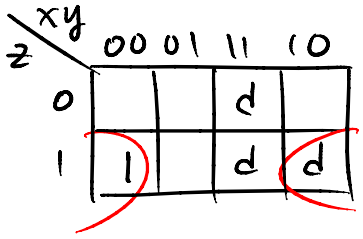
$f = \bar{w}y\bar{z} + x\bar{z} + wz$

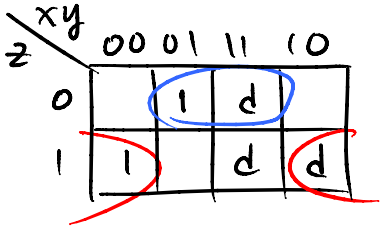
gate 4, gate 7, gate 8

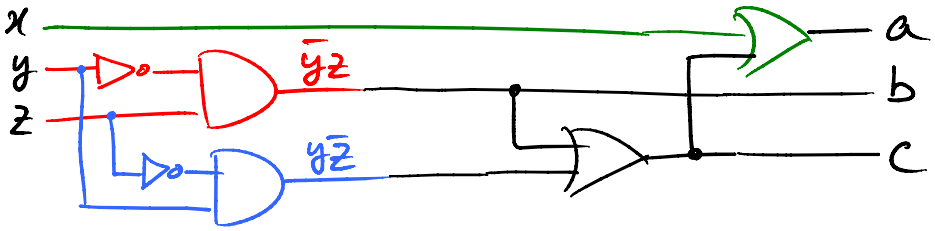
gates to remove = 2, 5 and 6

Q4. 7-seg. display, find SOP for a, b and c to achieve min. total cost

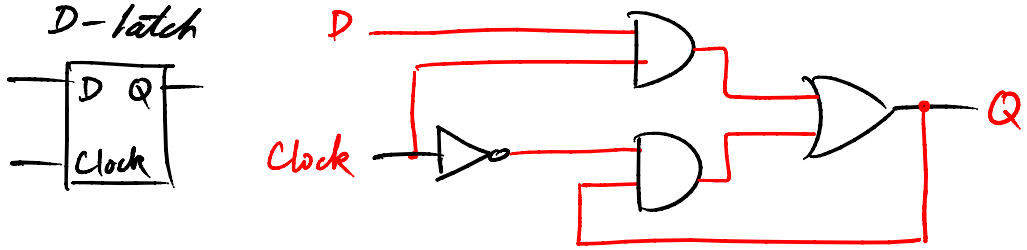




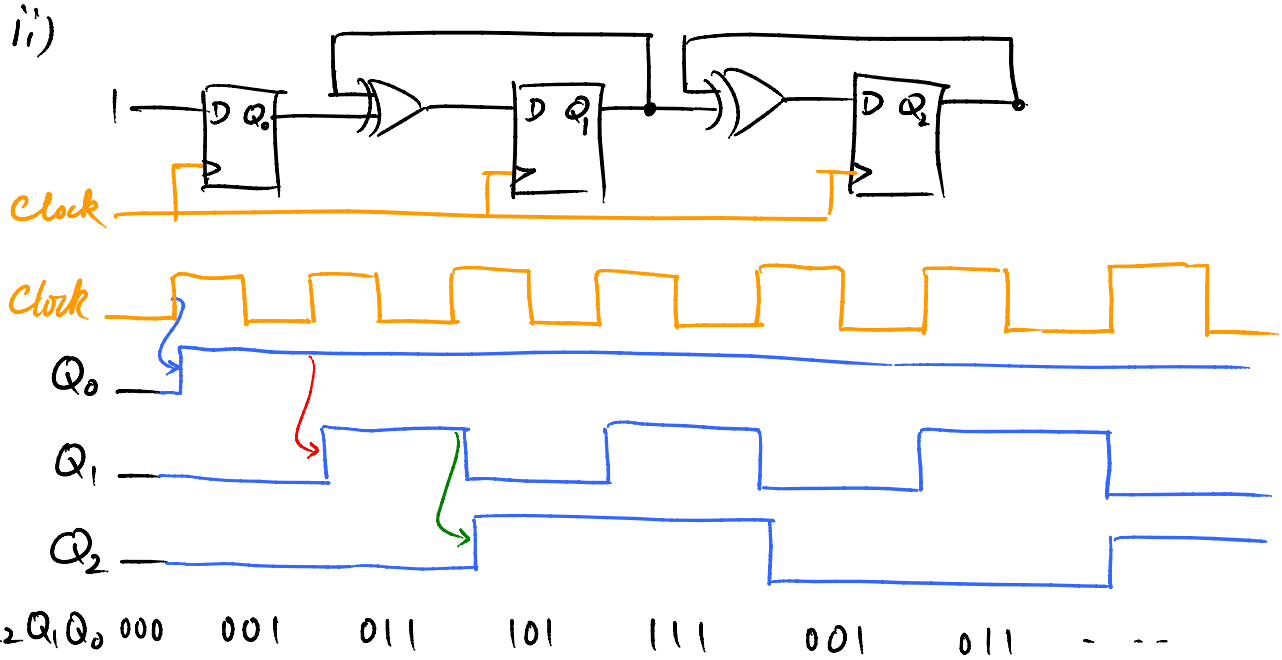




Q6. i)



ii)



$Q_2Q_1Q_0$ 000 001 011 101 111 001 011 - --

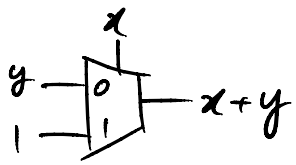
Counts through sequence 1, 3, 5, 7, 1, 3 ··· (ie. all odd 3-bit #s)

Q7. consider 3-bits input $S_2\,S_1\,S_0$ and 3-bits output $Z_2Z_1Z_0$, for input numbers 0, 1, 2 or 3, outputs should get one greater then the input numbers. for the rest, outputs should get one less than the input numbers.

i) truth table

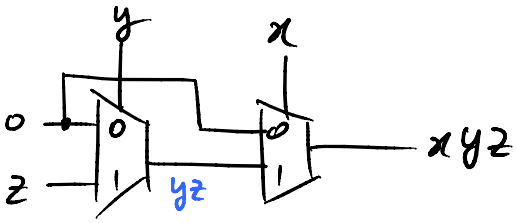
S_2	S_1	S_0	Z_2	Z_1	Z_0	
0	0	0	0	0	1	$Z = S+1$
0	0	1	0	1	0	
0	1	0	0	1	1	
0	1	1	1	0	0	
1	0	0	0	1	1	$Z = S-1$
1	0	1	1	0	0	
1	1	0	1	0	1	
1	1	1	1	1	0	

Q8 i)



This is a 2 input OR gate

ii)



This is a 3-input AND gate