Advanced Logic Design 2012
Assignment 3, 9 points, due 15/11

(1) **2 points** Draw ROBDDs for the Boolean functions defined below. Use variable ordering x_1, x_2, x_3, x_4.

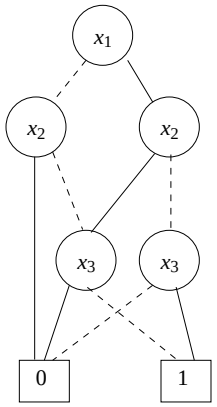
(a)

$x_3x_4 \backslash x_1x_2$	00	01	11	10
00	1	0	1	0
01	1	0	0	0
11	1	1	1	1
10	1	1	0	0

(b)

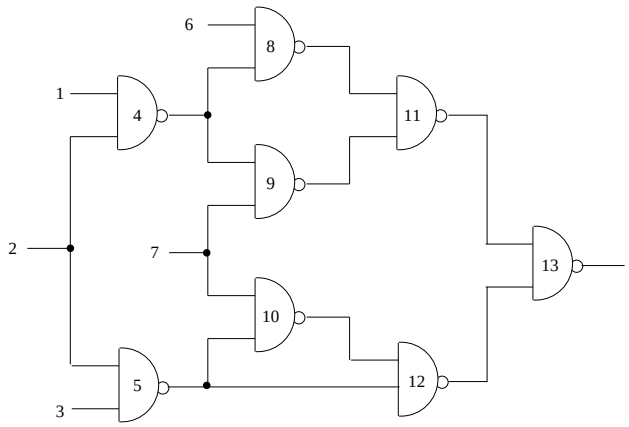
$x_3x_4 \backslash x_1x_2$	00	01	11	10
00	0	1	0	1
01	1	0	1	0
11	0	0	0	0
10	0	0	0	0

(1) **1 points** Find which Boolean function is represented by the ROBDD below. Give you answer in the form of a Karnaugh map.



(3) **2 points** Answer the questions about the circuit on the next page:

1. Is $\{9,10\}$ a 2-vertex dominator for 7?
2. Is $\{8,9\}$ a 2-vertex dominator for 1?
3. Is $\{10,12\}$ a 2-vertex dominator for 5?
4. Is $\{4,5,8\}$ a 3-vertex dominator for 2?
5. Is $\{10,11,12\}$ a 3-vertex dominator for 7?



6. Is 12 a 1-vertex dominator for 3?

(4) **1 point** Consider the Boolean function:

$x_3x_4 \backslash x_1x_2$	00	01	11	10
00	1	0	1	0
01	1	0	0	0
11	1	1	1	1
10	1	1	1	0

(a) List all its prime implicants.

(b) List all its essential prime implicants.

(c) Is the cover given by the set of all primes of this function is irredundant? If not, make it irredundant.

(5) **1 point** Repeat problem 4(a)-(c) for the incompletely specified function whose on-set is the same as in problem 4 and whose don't care set is $\{1101, 1001\}$ (the variables in cubes are ordered as (x_1, x_2, x_3, x_4)).

(6) **2 points** Use Quine-McCluskey procedure to minimize the function from problem 5. Show the results at each steps (i.e. list the primes, give the matrix, and show how the minimum cover is obtained).