

EE115B, Fall 2022, Homework 4

Solution

1. (a) NAND

$$Y = A\bar{B}C + B\bar{C} = \overline{\overline{A\bar{B}C + B\bar{C}}} = \overline{\overline{A\bar{B}C} \cdot \overline{B\bar{C}}}$$

(b) AOI

		BC			
A	0	00	01	11	10
	1	00	01	11	10

Red: EP1s ($\bar{B}\bar{C}$, BC)

Blue: P1s ($\bar{A}\bar{B}$, $\bar{A}C$)

$$Y = \overline{\bar{B}\bar{C} + BC + \bar{A}\bar{B}}$$

$$(OR, Y = \overline{\bar{B}\bar{C} + BC + \bar{A}\bar{B}})$$

(c) NOR

$$Y = \overline{\bar{B}\bar{C} + BC + \bar{A}\bar{B}} = \overline{\overline{B+C} + \overline{B+\bar{C}} + \overline{A+B}}$$

$$(OR, Y = \overline{\bar{B}\bar{C} + BC + \bar{A}\bar{B}} = \overline{\overline{B+C} + \overline{B+\bar{C}} + \overline{A+B}})$$

2. (a) Truth table

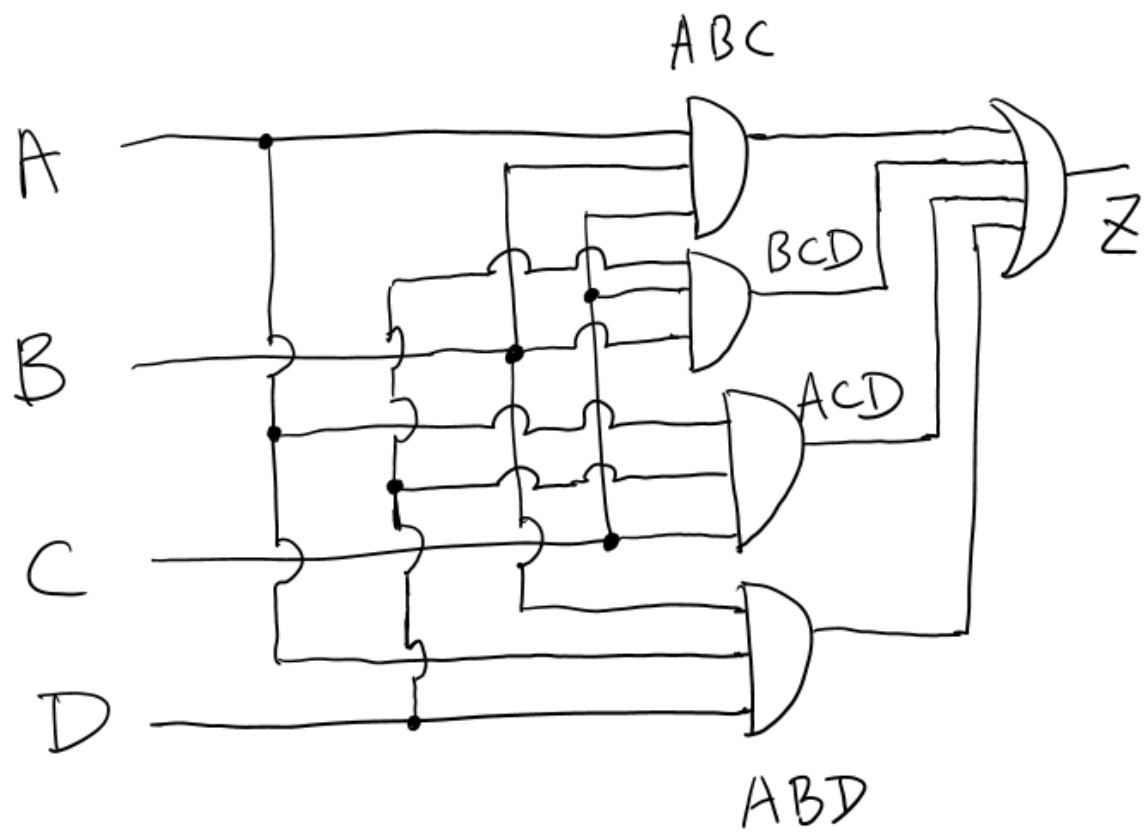
A	B	C	D	Z
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

(b) AND-OR logic

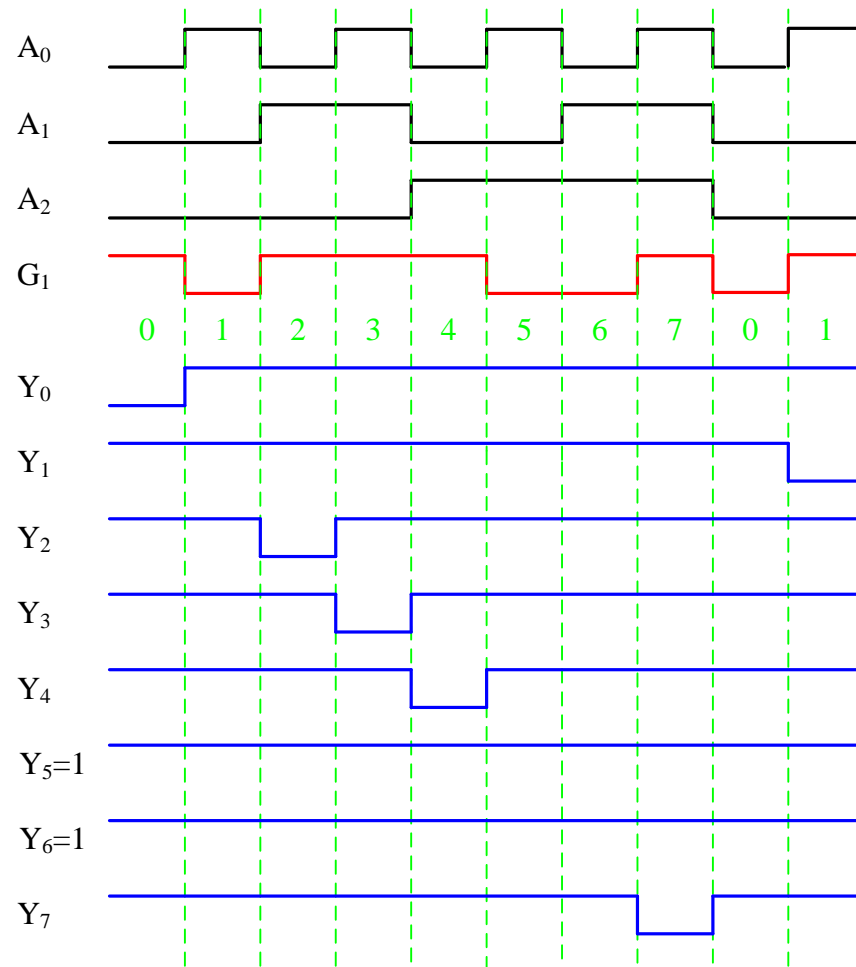
AB	CD			
	00	01	11	10
00				
01			1	
11		1	1	1
10			1	

$$Z = ABC + ABD + ACD + BCD$$

(c) Circuit diagram



3. Output waveforms.



4. Output waveform.

