Homework 1 - Solutions

Q1.

$F = \overline{X}\,\overline{Z} + XYZ$

X	Y	Z	$\overline{X}\,\overline{Z}$	XYZ	F
0	0	0	1	0	1
0	0	1	0	0	0
0	1	0	1	0	1
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	0	0
1	1	0	0	0	0
1	1	1	0	1	1

Q2.

$F = \overline{(\overline{XYZ})(\overline{\overline{X}Y})}$

X	Y	Z	$\overline{XYZ}$	$\overline{\overline{X}Y}$	F
0	0	0	1	1	0
0	0	1	1	1	0
0	1	0	1	0	1
0	1	1	1	0	1
1	0	0	1	1	0
1	0	1	1	1	0
1	1	0	1	1	0
1	1	1	0	1	1

Q3.

(a)

$\overline{F} = \overline{B}D + \overline{A}B\overline{C} + ACD + \overline{A}BC$

$F = \overline{(\overline{B}D + \overline{A}B\overline{C} + ACD + \overline{A}BC)}$

$= \overline{(\overline{B}D + \overline{A}B(\overline{C}+C) + ACD)}$

$= \overline{(\overline{B}D + \overline{A}B + ACD)}$

$= (B+\overline{D})(A+\overline{B})(\overline{A}+\overline{C}+\overline{D})$

$= (AB + A\overline{D} + B\overline{B} + \overline{B}\,\overline{D})(\overline{A}+\overline{C}+\overline{D})$

$= \overline{A}\,\overline{B}\,\overline{D} + AB\overline{C} + A\overline{C}\,\overline{D} + \overline{B}\,\overline{C}\,\overline{D}$

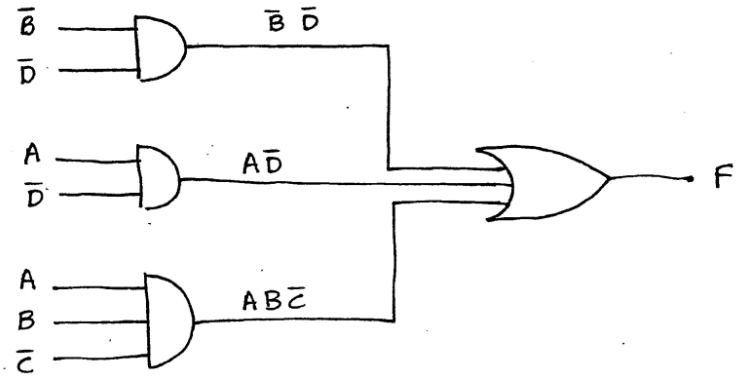
$+ AB\overline{D} + A\overline{D} + \overline{B}\,\overline{D}$

$= \overline{B}\,\overline{D}[1+\overline{A}+\overline{C}] + A\overline{D}[1+\overline{C}+B]$

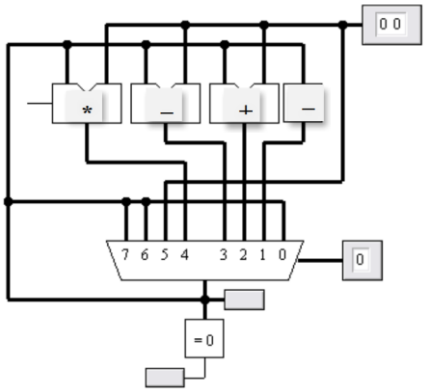
$+ AB\overline{C}$

$F = \overline{B}\,\overline{D} + A\overline{D} + AB\overline{C}$

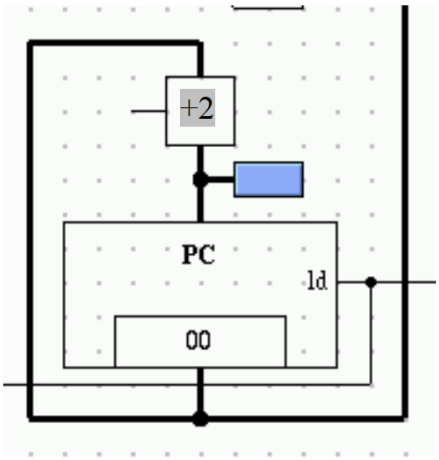
(b)



Q4.



Q5.



Q6.

Address	Opcode Data	Mnemonic	Comment
00	08 00	LOAD #0	Clear result memory cell ($FF)
02	01 FF	STORE FF	
04	00 A1	LOAD	Load first operand ($ A1) ..
06	07 FF	BEQ -1	.. done if 0 (BEQ -1 equiv. to dynamic HALT)
08	0C 01	SUB #1	Subtract 1 from first operand
0A	01 A1	STORE A1	
0C	00 A2	LOAD A2	Load second operand ($ A2) and add to result
0E	03 FF	ADD FF	
10	01 FF	STORE FF	
12	0F F1	BRA -15	Branch to loop (address 4)