Digital Circuits: Homeworks #2

Due on Friday, April 14, 2017

Note: Late homework is not accepted. Good luck

1. **Truth Table.**
   Construct a truth table of following Boolean expressions
   (a) $X = AB + \bar{B}C + CA$.
   (b) $X = (A + B)(B + \bar{C})(C + A)$.

2. **Standard Forms of Boolean Expressions**
   (a) Convert $X = (A + C)(CD + AC)$ to sum-of-product (SOP) form.
   (b) Convert $X = (A + C)(CD + AC)$ to product-of-sum (POS) form.
   (c) Convert $X = \overline{\overline{AB}(CD + \bar{E}F)(\overline{AB} + \overline{CD})}$ to sum-of-product (SOP) form.

3. **Karnaugh Map**
   Let $X = A\bar{B} + B\bar{C} + CD + AC\bar{D}$.
   (a) Develop a truth table of X
   (b) Use a Karnaugh map to reduce X to a minimum SOP form.
   (c) Use a Karnaugh map to reduce X to a minimum POS form.

4. **Karnaugh Map 2**
   Let $X = (\bar{A} + B)(\bar{A} + \bar{B} + \bar{C})(B + \bar{C} + D)(A + \bar{B} + C + \bar{D})$.
   (a) Develop a truth table of X
   (b) Use a Karnaugh map to reduce X to a minimum SOP form.
   (c) Use a Karnaugh map to reduce X to a minimum POS form.

5. **Don't Care!**
   For the following truth table, answer the following questions. Note that "x" means don't care.

A	B	C	D	X
0	0	0	0	x
0	0	0	1	x
0	0	1	0	0
0	0	1	1	0
0	1	0	0	x
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	x
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

(a) Draw a K-map (show all 0s, 1s, and x's).

(b) Derive a minimum SOP expression using K-map.

(c) Derive a minimum POS expression using K-map.