

HOMEWORK 2 - due September 11th at ≤6pm

1) Boolean Algebra (14)

- a) Use a Truth Table to prove that the De Morgan's identity also holds for three variables:
 $\overline{A+B+C} = \overline{A} \cdot \overline{B} \cdot \overline{C}$
- b) Apply DeMorgan's rule to $\overline{B+E \cdot \overline{S+T} \cdot (G+M+U)}$ and simplify until there are only AND, OR and NOT(single variable) expressions. Indicate in each step which rule you applied.

2) Minimization using Boolean Algebra (32)

Minimize the following equations using the laws and rules of boolean algebra. In each step indicate the rule/law that was used. **Writing just the answer will result in 0 points!**

- a) $X_{A,B,C,D} = \overline{A}B\overline{C}\overline{D} + \overline{A}BCD + \overline{A}B\overline{C}D + A\overline{B}C\overline{D}$
- b) $X_{A,B} = A(A + \overline{A}B)$ (Hint: result is A)
- c) $X_{A,B,C,D} = \overline{A}\overline{B}C + \overline{(A+B+C)} + \overline{A}\overline{B}\overline{C}D$ (Hint: result is: $\overline{A}\overline{B}C + \overline{A}\overline{B}D$)
- d) $F_{X,Y,Z} = XYZ[X Y + \overline{Z}(Y Z + X Z)]$ (Hint: result is a single Minterm)

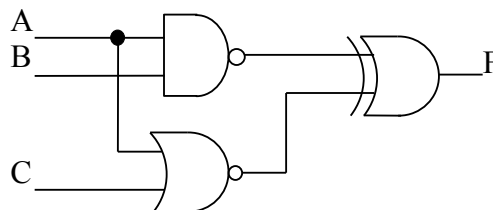
3) Karnaugh Maps (24)

Use a Karnaugh map to simplify in SOP form:

- a) $X_{A,B,C,D} = \sum(4,6,7)$
- b) $X_{g,m,u,v} = \sum(2 - 7, 9, 12-15)$
- c) $F_{X,Y,Z} = \sum(0,1,4,5,7)$

4) Logic Circuit Analysis (10)

Determine the **minimized SOP** expression for the circuit below:



5) Logic Circuit Design (20)

- a) Design a minimized SOP circuit for the logic function described by the truth table below.

x_1	x_2	x_3	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

- b) Design a minimized SOP circuit for the logic function described by the truth table below

x_1	x_2	x_3	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1



Student: _____

Homework (>0 and <13): _____

Grade: _____

HOMEWORK FEEDBACK

First some “rules” to help us grade the homeworks:

- **Order** and **staple** your pages.
- Write your name on this cover page, which hopefully will be your first page (if you read these rules), and on the first page of your homework.
- Always complete the reading assignments *before* attempting the homework problems.
- Show all of your work. Use written English, where applicable, to provide a log of your steps in solving a problem. (For numerical homework problems, the writing can be brief... or inexistent.)
- Always write neatly. Communication skills are essential in engineering and science. If neither the TA nor the instructor can read it, you will receive zero points.

After finishing your homework, complete this section:

- If you worked on it with classmates and your solutions might be TOO similar, write their names here: _____
- The homework helped you understand the topics it addresses? Yes No
- How long did it take you to work on the homework (don't count the reading assignment!) 2h 4h 6h 8h 10h infinite hours
- Do you have suggestions on how to improve it? (ideas for new exercises?) Let us know here (and/or use the back of this sheet):