

EENG 2710.003 – Digital Logic Design

FALL 2020

Homework #2

NAME: _____

ID: _____

Assigned: Monday Sep. 14, 2020

Due: Monday Sep. 21, 2020 5:00PM via Canvas

Total points possible : 140 (7 problems)

Late submission policy:

24 hr. late – 10% penalty

48 hr. late – 20% penalty

>48 hr. late – NOT ACCEPTED. A grade of zero will be assigned. Lateness will be determined by the time of submission on Canvas.

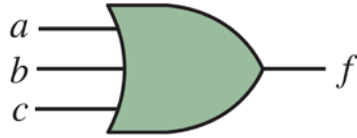
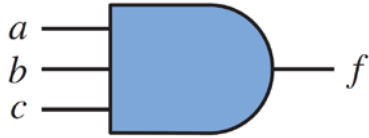
Homework submission:

- **If you have access to a printer:** print out the homework and write the solutions in the space provided. Insert additional pages if needed but please make sure they clearly indicate which problem they belong to. Assemble all sheets, number them sequentially, scan them into a **single** pdf file using a scanner or your cell phone and submit the file via Canvas before the deadline.
- **If you do not have access to a printer:** Write out the answers to the problems by hand, one problem per page. Make sure you clearly label which problem solution the sheet belongs to. Assemble all sheets, number them sequentially, scan them into a **single** pdf file using a scanner or your cell phone and submit the file via Canvas before the deadline.

Note: Canvas will only allow you to submit a pdf file. No other file types (zip, doc, etc.) will be accepted.

Problem 1 (20 points)

Construct the truth tables for the following 3-input gates (AND and OR). They are defined by $abc = a(bc) = (ab)c$ and $a+b+c = a+(b+c) = (a+b)+c$.



Problem 2 (20 points)

Construct the truth tables for the following functions:

a) $f(a,b,c) = ab + \bar{a}c$

b) $g(a,b,c) = \prod M(2,5,6,7)$

c) $h(a,b,c) = \sum m(0,5,7)$

Problem 3 (20 points)

Simplify as much as possible the following two functions using the postulates and theorems of Boolean algebra. Show your work but you do not need to state which postulates/theorems you use.

a) $f_1(A, B, C) = (\bar{A}B + AC)(A + \bar{B})$

b) $f_2(x, y, z, w) = x + xyz + \bar{x}yz + wx + \bar{w}x + xyz$

Problem 4 (20 points)

Use DeMorgan's theorem to complement the following expressions. Show your work but you do not need to state which postulates/theorems you use.

a) $f = XY + A\bar{C} + DE$

b) $g = X(Y + \bar{Z}(Q + \bar{R}))$

Problem 5 (20 points)

Express the functions f and \bar{f} in **canonical** SOP and POS form. f is defined in the following truth table:

x	y	z	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Problem 6 (20 points)

Given the function $f(x, y, z) = x\bar{y} + x\bar{z}$, write $f(x, y, z)$ in **canonical (full)** SOP and POS form. Give the truth table for f and \bar{f} .

Problem 7 (20 points)

Derive the **simplest** logic equation and circuit diagram for a circuit with three inputs A , B , and C . The output f is to be high only when exactly two of the three inputs is high. You have AND, OR and NOT gates available. Use the SOP form of the function. Hint: *use the online Karnaugh solver (you do not need to know Karnaugh maps to use it to obtain the minimum SOP form).*