CS2100 (AY2018/9 Semester 2)
Assignment #2

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Tutorial Grp: 20

You are to do this assignment **on your own**. (Students found copying will be penalised.) Please fill in your **name** and **tutorial group number** in the boxes above, and your answers in the space indicated below. You are not required to show workings.

Please submit this assignment by **22 March 2019, Friday, 23:59** to the submission File on LumiNUS according to your tutorial group**.** Please submit either a .docx or .pdf file. Please include your name in your filename, eg: AaronTan_assign2.pdf.

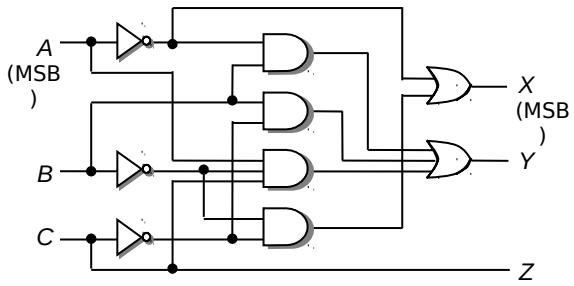
Late submission and email submission will not be accepted.

1. Given a Boolean function with 8 variables *A*, *B*, *C*, *D*, *E*, *F*, *G* and *H*, what is
   (a) minterm ***m*160**? (b) maxterm ***M*51**? [2 marks]

   (a) $m160 = A \cdot B' \cdot C \cdot D' \cdot E' \cdot F' \cdot G' \cdot H'$

   (b) $M51 = A + B + C' + D' + E + F + G' + H'$

2. The logic circuit below is a code converter. [4 marks]



Write out the simplified SOP expressions for *X*, *Y* and *Z*.

Answers: $X = A' + B' \cdot C'$

$Y = A' \cdot B + B \cdot C' + A \cdot B' \cdot C$

$Z = C$

Which of the following statement is correct about the circuit?

A. It converts a 3-bit 2's complement number to 3-bit excess 4 code.
B. It converts a 3-bit excess 4 code to 3-bit 2's complement number.
C. It converts a 3-bit 2's complement number to 3-bit 1's complement number.
D. It converts a 3-bit sign-and-magnitude code to 3-bit excess 4 code.

E. It converts a 3-bit excess 4 code to 3-bit sign-and-magnitude code.

Answer: D

3. Fill in the K-map for the function *F1*(*P*,*Q*,*R*,*S*) below. You are not to change the layout of the given K-map. The *D*'s denote the don't-cares.

F1(P,Q,R,S) = ΠM(0, 2, 9, 10, 11, 13, 14, 15) • Π *D*(1, 3, 4, 7, 8) [2 marks]

PQ \ RS	00	01	11	10
00	0	X	X	0
01	X	1	X	1
11	1	0	0	0
10	X	0	0	0

4. Given *F2*(*A*,*B*,*C*,*D*) below, determine the number of prime implicants (PIs) and essential prime implicants (EPIs) on the K-map of *F2*, the simplified SOP expression and the simplified POS expression for *F2* (where there are two or more simplified SOP/POS expressions, you need supply only one). The X's denote the don't-cares.

F2(A,B,C,D) = Σm(2, 5, 8, 10, 12, 15) + Σx(0, 6, 13, 14) [4 marks]

Number of PIs = 5

Number of EPIs = 2

Simplified SOP expression for *F2* = A · B + B'·D' + B · C' · D

Simplified POS expression for *F2* = (A + B' + D) · (A + B' + C') · (B + D')

5 Given the following function:

F3(A,B,C,D) = Σm(1, 2, 4, 11, 13, 14) + Σx(5 – 10) [3 marks]

(a) Write the simplified SOP expression for *F3*.

F3 = A' · B + A · B' + C · D' + C'·D

(b) Provide an alternative expression for *F3* which can be implemented with at most three logic gates.

F3 = $A \oplus B + C \oplus D$