Digital Engineering 2nd report

● **제출 : 4월 22일(화) 수업시간**

● **디지털 공학 과제 주의사항**

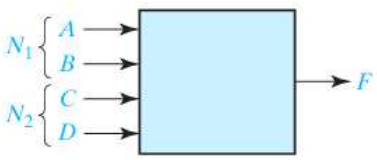
1. 과제는 반드시 **자필**로 작성하셔야 합니다.
2. **문제 풀이 과정**이 다 들어가 있어야 하며, 답에는 반드시 **밑줄이나 박스** 등의 답을 알아볼 수 있는 표기 바랍니다.
3. **A4용지**에 반드시 **학번 이름**을 포함하여 제출 바랍니다.
4. 문제는 **7판 원서** 기준으로 출제되었습니다.
5. 스테이플러는 종이 **왼쪽**에 찍어주시기 바랍니다.
6. 문제의 순서가 명확하도록 **페이지 번호** 표기바랍니다.
7. 풀이과정을 알아볼 수 없는 경우 불이익이 발생할 수 있습니다.

4.8 A switching circuit has four inputs as shown. A and B represent the first and second bits of a binary number N_1. C and D represent the first and second bits of a binary number N_2. The output is to be 1 only if the product $N_1 \times N_2$ is less than or equal to 2.

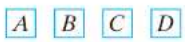
(a) Find the minterm expansion for F.

(b) Find the maxterm expansion for F.

Express your answers in both decimal notation and algebraic form.



4.25 Four chairs are placed in a row:



Each chair may be occupied (1) or empty (0). Give the minterm and maxterm expansion for each logic function described.

(a) $F(A, B, C, D)$ is 1 iff there are no adjacent empty chairs.

(b) $G(A, B, C, D)$ is 1 iff the chairs on the ends are both empty.

(c) $H(A, B, C, D)$ is 1 iff at least three chairs are full.

(d) $J(A, B, C, D)$ is 1 iff there are more people sitting in the left two chairs than in the right two chairs.

4.27 Given $f(a, b, c) = a(b + c')$.

(a) Express f as a minterm expansion (use m-notation).
(b) Express f as maxterm expansion (use M-notation).
(c) Express f' as a minterm expansion (use m-notation).
(d) Express f' as a maxterm expansion (use M-notation).

5.3 Find the minimum sum of products for each function using a Karnaugh map.

(a) $f_1(a, b, c) = m_0 + m_2 + m_5 + m_6$
(b) $f_2(d, e, f) = \Sigma\, m(0, 1, 2, 4)$
(c) $f_3(r, s, t) = rt' + r's' + r's$
(d) $f_4(x, y, z) = M_0 \cdot M_5$

5.14 Find the minimum sum-of-products expressions for each of these functions.

(a) $f_1(A, B, C) = m_1 + m_2 + m_5 + m_7$
(b) $f_2(d, e, f) = \Sigma\, m(1, 5, 6, 7)$
(c) $f_3(r, s, t) = rs' + r's' + st'$
(d) $f_4(a, b, c) = m_0 + m_2 + m_3 + m_7$
(e) $f_5(n, p, q) = \Sigma\, m(1, 3, 4, 5)$
(f) $f_6(x, y, z) = M_1 M_7$

5.37 The function $F(A, B, C, D, E) = \Sigma\, m(1, 7, 8, 13, 16, 19) + \Sigma\, d(0, 3, 5, 6, 9, 10, 12, 15, 17, 18, 20, 23, 24, 27, 29, 30)$.

(a) Draw a Karnaugh map for f.
(b) Find all prime implicants of f. (Prime implicants containing only don't-cares need not be included.)
(c) Find all minimum sum of products for f.
(d) Find all prime implicants of f'.
(e) Find all minimum product of sums for f.