

NOTE1: OPEN BOOK, CLOSED NOTES.

NOTE2: SHOW ALL WORK IN ORDER TO RECEIVE FULL CREDIT.

- ✓ 1. 15 Pts. Perform the base conversions and binary operations indicated below.

$$(1040.9375)_{10} = ( \quad )_{16} = ( \quad )_8 = ( \quad )_2$$

$(1007.1)_8 - (1FF.C)_{16}$ . Use two's complement addition.

2. 25 Pts. Which of the following four variable functions are equivalent? Justify your answer.

$$F_1 = \sum m(0, 2, 5, 7, 8, 10, 13, 15)$$

$$F_2 = (A + B)' + CD(A' + B') + ((B'C'D')'(ABC'D)')(ABCD')'$$

$$F_3 = ((B + D)(B' + D'))' + ABD + (B' + C' + D)'$$

$$F_4 = \prod M(4, 5, 6, 9, 10, 12, 15)$$

$$F_5 = AB' + CD + A'D + A'BC + A'B'C'$$

$$F_6 = (B' + C + D)(A' + B' + C)(A' + B' + D)(A + B + C' + D)$$

3. 20 Pts. Find the minterm and maxterm list forms for the function defined by the logic diagram in Fig.P3.

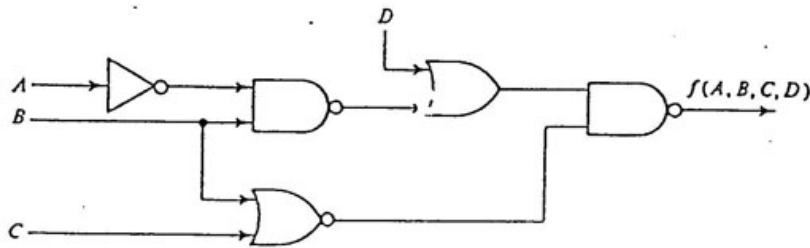


Fig.P3.

4. 20 Pts.  $F(A,B,C,D,E) = \prod M(0, 3, 6, 9, 11, 19, 20, 24, 25, 26, 27, 28, 29, 30)$   
 $\cdot \prod D(1, 2, 12, 13)$

- a. Find two minimum sum-of-products expressions for F.

b. Underline the essential prime implicants in your answer.

5.20 Pts. Design a switching network which has five input variables and one output variable. Four of the input variables represent BCD digits, while the fifth is a control line. While the control line is a logic 0, the output should be logic 1 only if the BCD digit is greater than or equal to 5. While the control line is high, the output should be logic 1 only if the BCD digit is less than or equal to 5.

Solution

Summer 2002

EEN 220

LOGIC DESIGN

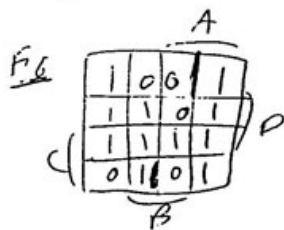
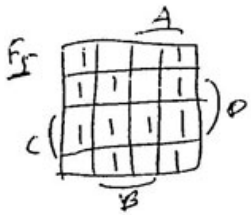
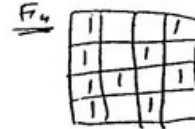
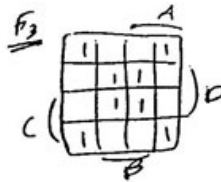
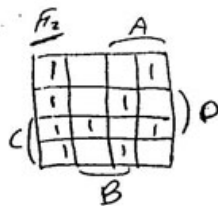
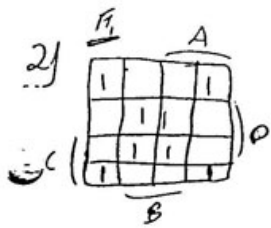
Test 1

$$y (1040.9375)_{10} = (10000010000.1111)_2 (2020.74)_8 = (410.F)_{16}$$

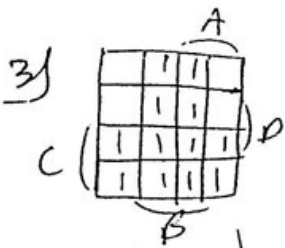
$$(1007.1)_8 - (1FF.C)_{16} =$$

$$\begin{array}{r} 1000000111.0010 \\ - 01111111.1100 \\ \hline \end{array}$$

$$\begin{array}{r} 01000000111.0010 \\ 1100000000.0100 \\ \hline 10000000111.0110 \end{array}$$

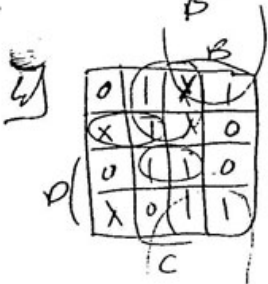
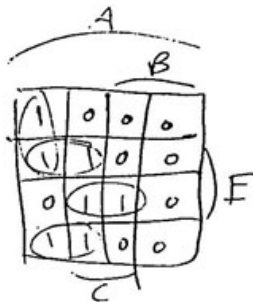


$$\begin{array}{l} F_5 = F_6 \\ F_1 = F_3 \\ F_2 = F_4 \end{array}$$



$$\Sigma (2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15)$$

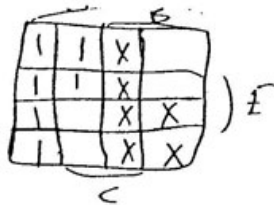
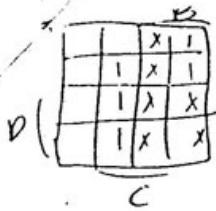
$$\Pi M (0, 1, 8, 9)$$



$A'CD'$   $A'BE'$   $CDE$   $B'D'E$  essential

$$A'CD' + A'BE' + CDE + AB'C'D' + B'D'E + AB'DE'$$

$$A'CD' + A'BE' + CDE + AB'C'E' + B'D'E + AB'CD$$



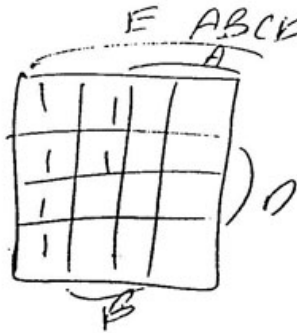
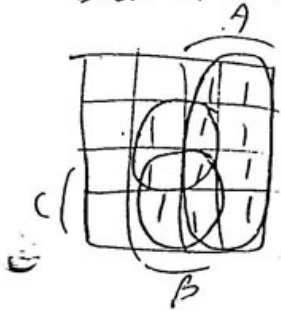
with X:

$$F(A, B, C, D, E) = A'B + AB'C' + A'CE + A'CD + ACD'$$

no X:

$$AB'C' + AB'D' + A'BC'D' + A'B'CD + A'B'CE$$

Essential prime



$$AE' + A'B'E + A'C'E + BDE' + BCE'$$