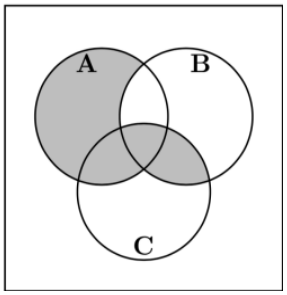
CprE 2810 HW05
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Midterm Review Assignment
Assigned Date: Fifth Week
Due Date: Monday, Sep. 30, 2024

P1. (15 points)

A. Convert $CAFE_{16}$ to binary.
B. Convert $CAFE_{16}$ to quaternary (base 4).
C. Convert $CAFE_{16}$ to octal.
D. Convert $CAFE_{16}$ to decimal.
E. Convert CAFE to breakfast.

P2. (20 points) For the Venn diagram shown below:



A. Draw the corresponding truth table.
B. Draw the corresponding K-map.
C. Write the minimized POS expression.
D. Draw the circuit diagram for the minimum-cost POS expression.

P3. (15 points) Given the logic expression:

$$G(A,B,C) = ((A + A'B) \cdot (B + C \cdot A') + (A + B \cdot C') \cdot (A' + B'C))'$$

A. Use the theorems of Boolean algebra to simplify the formula given above into a minimum-cost expression.

B. Draw the circuit diagram for the minimized G using only AND, OR, and NOT gates.

C. Draw the circuit diagram for the simplified expression using only NAND gates.

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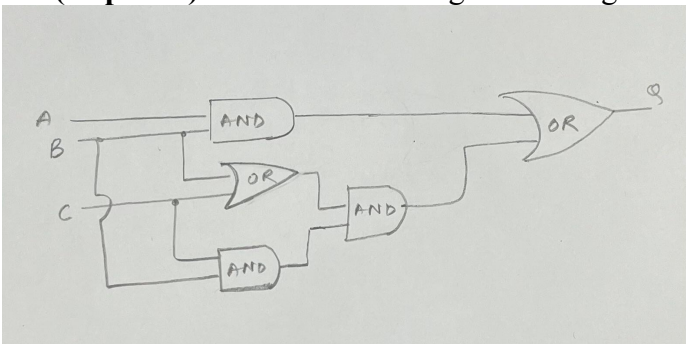
P4. (15 points) Given the following circuit diagram:



A. Write the logic expression for Q.

B. Use the theorems of Boolean algebra to simplify the formula for Q from A) into a minimum-cost expression.

C. Draw the circuit diagram for the minimized Q using only AND, OR, and NOT gates.

P5. (15 points) Four Variable K-Maps.

A. Draw the K-map for $\mathbf{F = a\,\bar{b}\,c + a\,b\,\bar{d} + \bar{a}\,b\,c\,d + a\,\bar{c}\,\bar{d}}$.

B. Draw another K-map to derive the minimum-cost SOP expression for **F**.

C. Draw another K-map to derive the minimum-cost POS expression for **F**.

P6. (20 points): Minimize the following Boolean function:

A. $F(A,B,C,D)= \sum m(0,1,2,5,7,8,9,10,13,15)$

B. $F(A,B,C,D)= \sum m(0,1,3,5,7,8,9,11,13,15)$

C. $F(A,B,C,D)= \sum m(1,3,4,6,8,9,11,13,15)+ \sum d(0,2,14)$

D. $F(A,B,C)= \sum m(0,1,6,7)+ \sum d(3,5)$