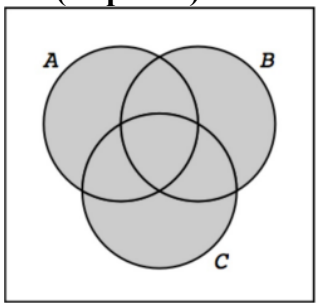
Cpr E 281 HW05
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

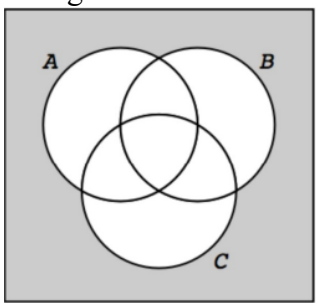
Midterm Review Assignment
Assigned Date: Fifth Week
Due Date: Monday, Sep. 25, 2023

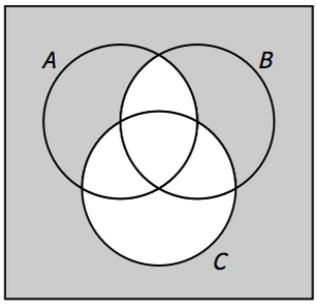
P1. (10 points)

A. Convert $BEEF_{16}$ to binary.
B. Convert $BEEF_{16}$ to quaternary (base 4).
C. Convert $BEEF_{16}$ to octal.
D. Convert $BEEF_{16}$ to decimal.
E. Convert BEEF to dinner.

P2. (25 points) For each Venn Diagram shown below:







A. Draw the corresponding truth table.
B. Draw the corresponding K-map.
C. Write the minimized SOP expression.
D. Write the minimized POS expression.

P3. (15 points) Given the logic expression:

$$F(X,Y,Z) = \overline{(X + \bar{X}\bar{Y})}(X + Y + \bar{Z}) + \overline{(X + \bar{Y} + X\bar{Y})}(\bar{X}\bar{Y}Z)$$

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 F using only AND, OR, and NOT gates.
C. Draw the circuit diagram for the simplified expression using only NOR gates.

P4. (15 points) Given the logic expression:

$$F(A,B,C,D) = \bar{A}(\bar{A} + C)\overline{(A\bar{B} + \bar{A}\bar{B} + \bar{C})(B + \bar{B}C)}$$

A. Use the theorems of Boolean algebra to simplify the formula given above into a minimum-cost SOP expression.
B. Draw the circuit diagram for the minimized F using only AND, OR, and NOT gates.
C. Draw the circuit diagram using only NAND gates

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

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

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P6. (20 points) You stumble across an old manuscript containing the following page, but some ink stains are obscuring part of the content. Deduce the function F(A, B, C) and write:

A. the complete K-map
B. the complete truth table
C. the minimized POS expression
D. the minimized SOP circuit diagram