

College of Charleston
Computer Science Department

CSCI 350 Digital Logic and Computer Organization
Spring 2020
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Assignment 3 Due February 11, 2020

Please do not complete the assignment on these sheets.

1. Use Karnaugh maps to give both a minimal SOP and a minimal POS expressions for each of the following functions.
 - a. $f(a, b, c) = \Sigma(0, 2, 4, 6, 7)$
 - b. $f(x, y, z) = \Sigma(1, 3, 4, 6, 7)$
 - c. $f(x, y, z, w) = \Sigma(2, 4, 6, 8, 9, 10, 11)$
 - d. $f(x, y, z, w) = \Pi(0, 1, 2, 5, 8, 9, 10)$
 - e. $f(a, b, c) = \Pi(2, 3, 4, 6)$
2. For problems 1 a., b., c. above draw a logic circuit based on the minimal SOP form.
3. For problems 1 d. and e. above draw a logic circuit based on the minimal POS form.

Assignment 3

Shetali Emmanuel

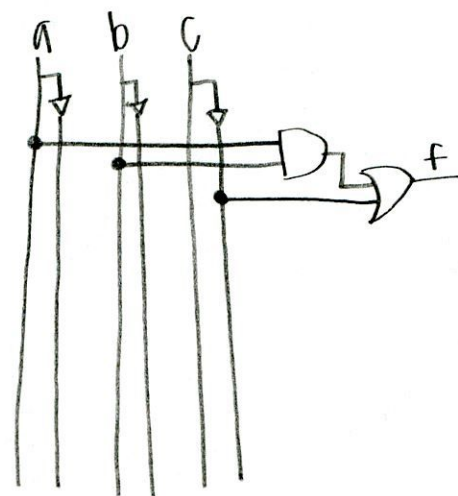
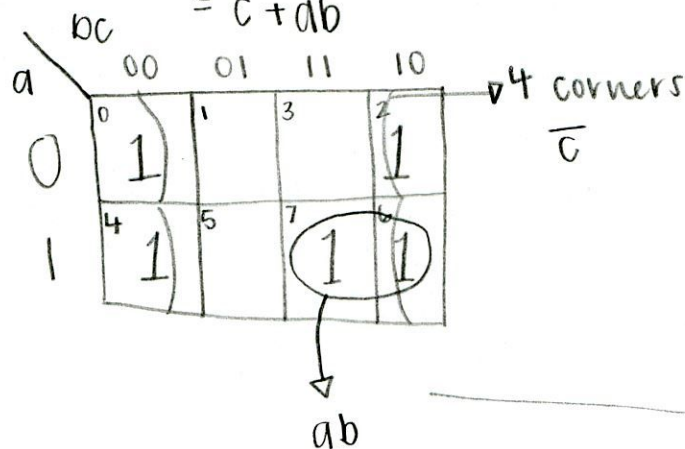
(1)

#1a

SOP

$$f(a, b, c) = \sum (0, 2, 4, 6, 7)$$

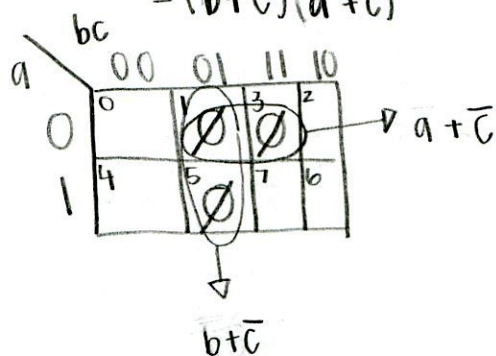
$$= \bar{c} + ab$$



POS

$$f(a, b, c) = \prod (1, 3, 5)$$

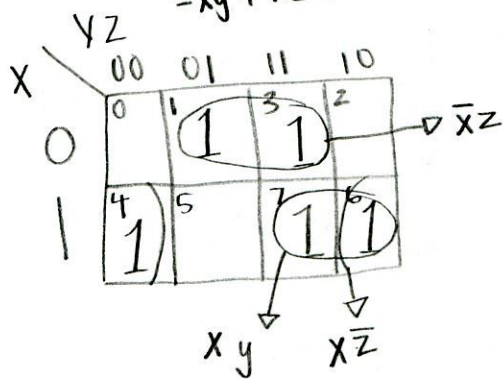
$$= (b + \bar{c})(a + \bar{c})$$



#1b

$$f(x, y, z) = \sum (1, 3, 4, 6, 7)$$

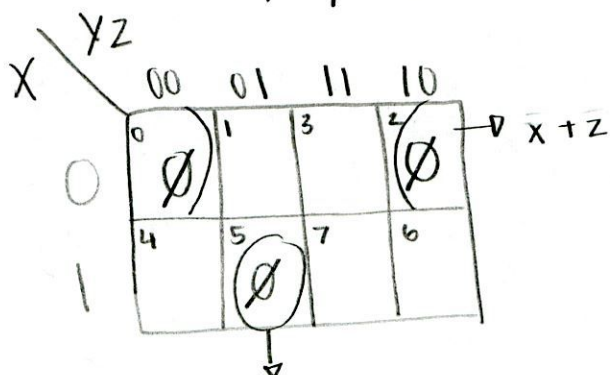
$$= xy + x\bar{z} + \bar{x}z$$



SOP

$$f(x, y, z) = \prod (0, 2, 5)$$

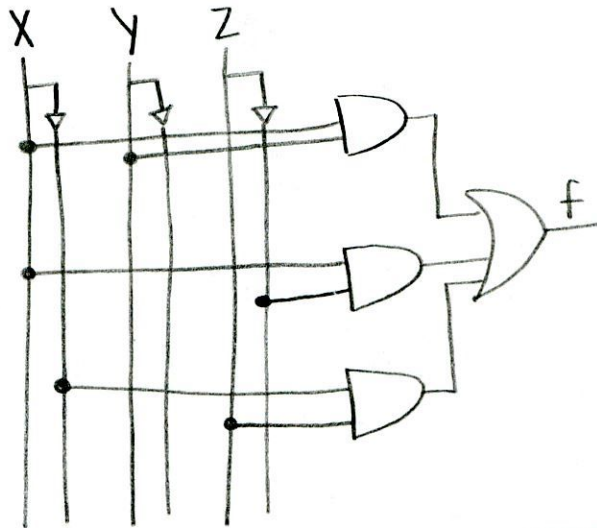
$$= (\bar{x} + y + \bar{z})(x + z)$$



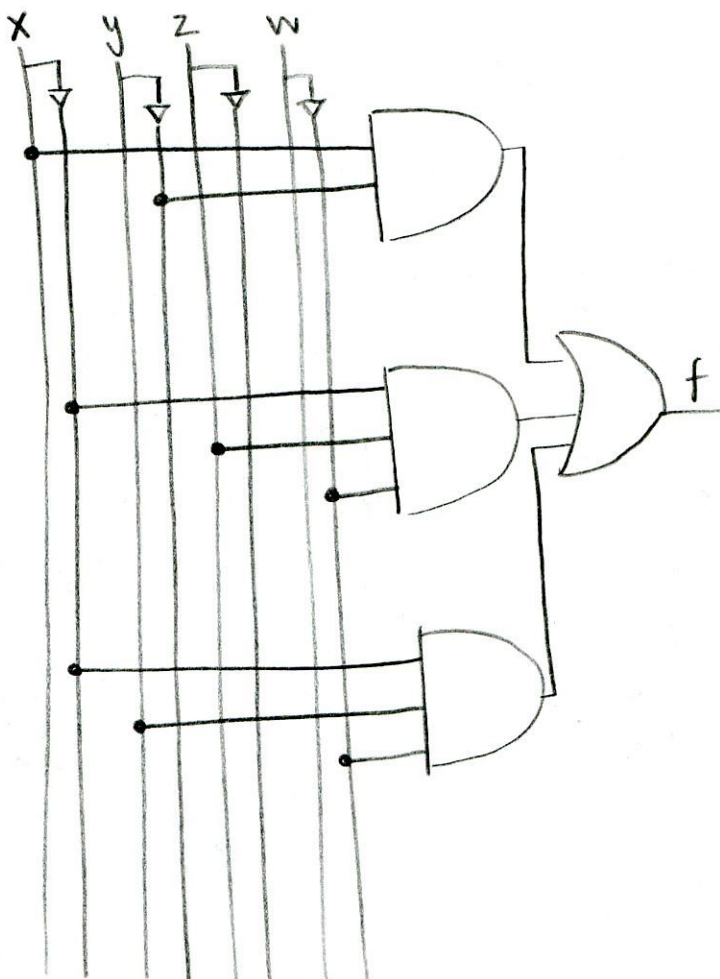
POS

#1b SOP Circuit

$$= xy + \underbrace{x\bar{z} + \bar{x}z}_{\text{physically adj, but not logically}}$$



#1c SOP Circuit



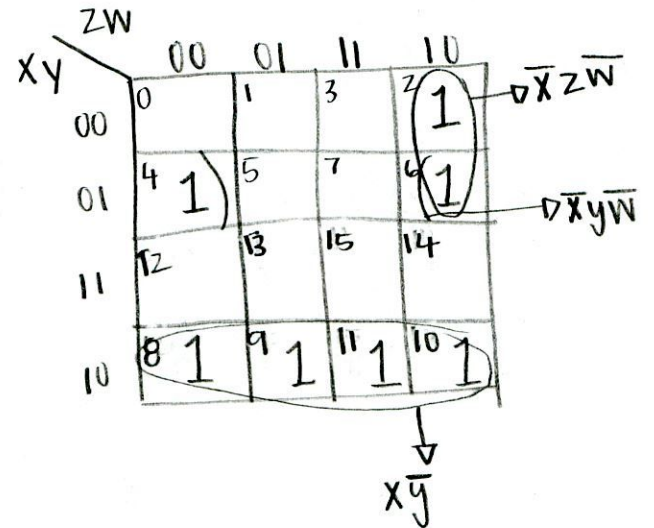
#1c

(2)

$$f(x, y, z, w)$$

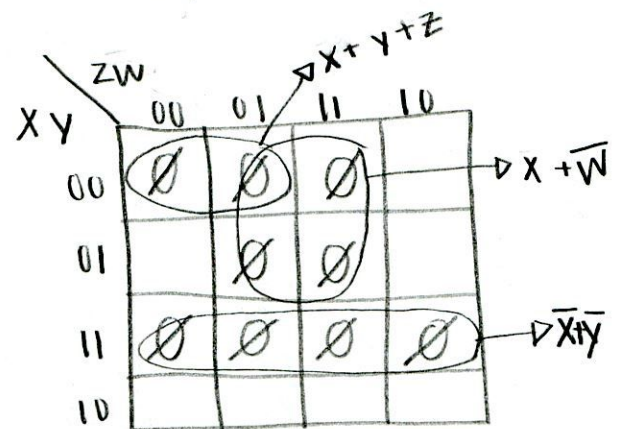
$$= \sum(2, 4, 6, 8, 9, 10, 11)$$

$$\text{SOP} = x\bar{y} + \bar{x}z\bar{w} + \bar{x}y\bar{w}$$



$$f(x, y, z, w)$$

$$= \prod(0, 1, 3, 5, 7, 12, 13, 15, 14)$$

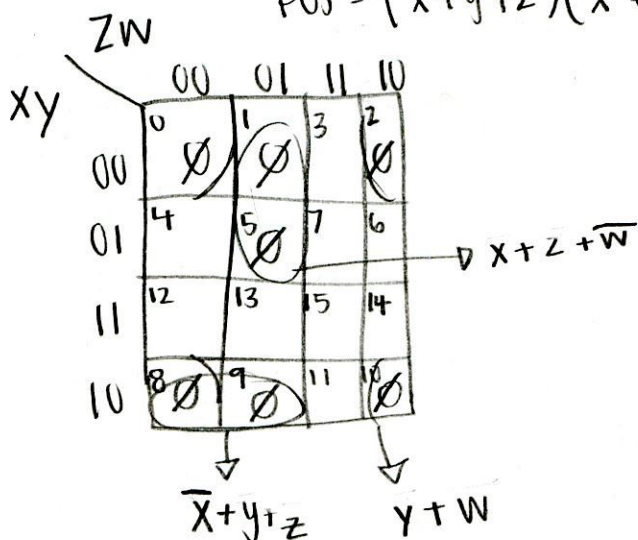


$$\text{POS} = (x + y + z)(\bar{x} + \bar{y})(x + \bar{w})$$

#1d $f(x, y, z, w) = \prod (0, 1, 2, 5, 8, 9, 10)$

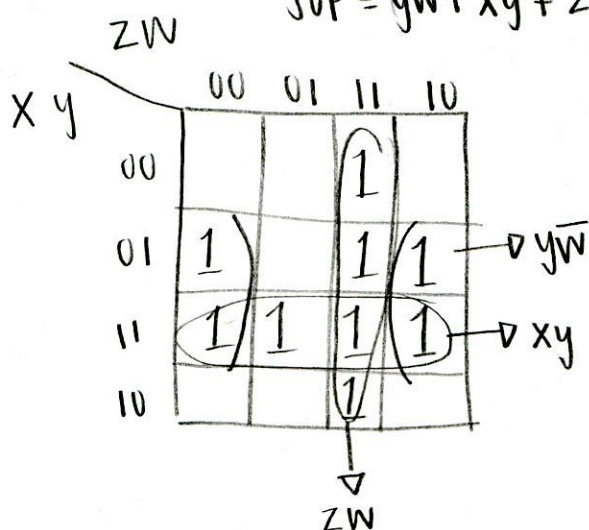
(3)

$$POS = (\bar{x} + y + z)(x + z + \bar{w})(y + w)$$

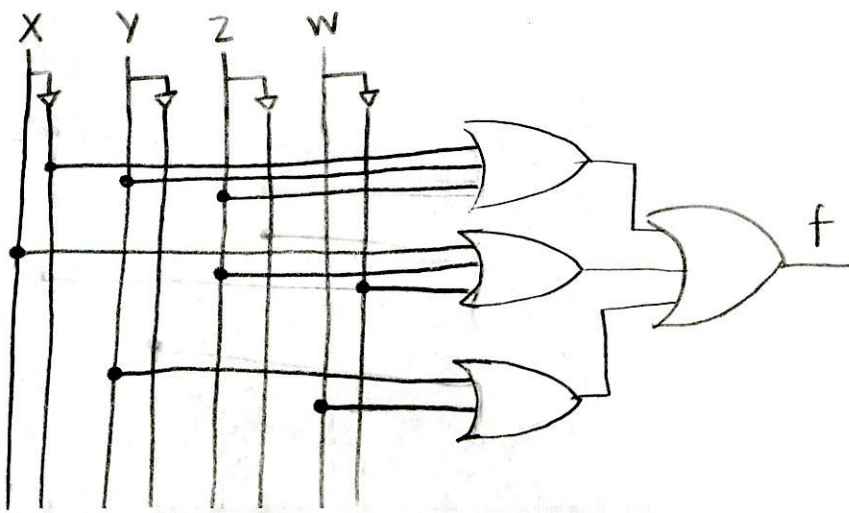


$$f(x, y, z, w) = \sum (3, 4, 6, 7, 11, 12, 13, 14, 15)$$

$$SOP = y\bar{w} + xy + zw$$



POS Circuit #1d

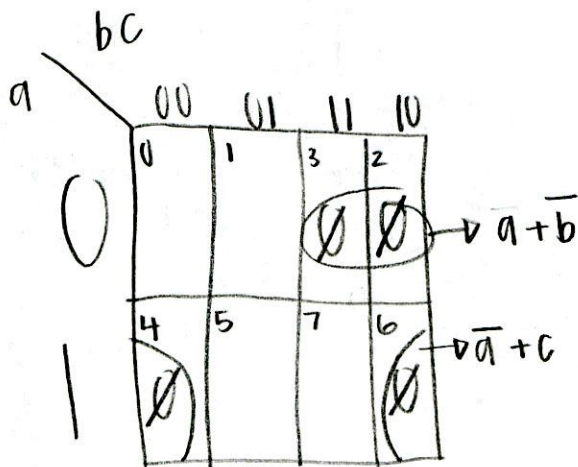


#1e

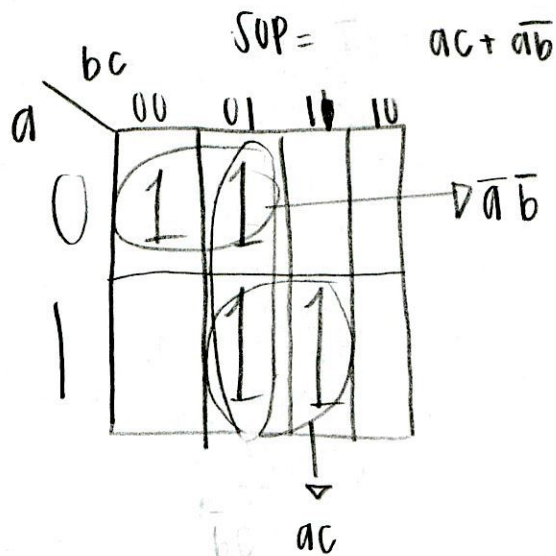
(4)

$$f(a, b, c) = \prod (2, 3, 4, 6)$$

$$POS = (a + \bar{b})(\bar{a} + c)$$



$$f(a, b, c) = \sum (0, 1, 5, 7)$$



POS Circuit

