Q2 $P_0 = (ABCDEFG)$

$P_1 = (ABCDE)(FG)$ [by observing the distinguishing outputs]

0-successors	1-successors
$A \to F$	$A \to B$
$B \to G$	$B \to A$
$C \to B$	$C \to C$
$D \to C$	$D \to B$
$E \to D$	$E \to A$
$F/G \to B/E$.	$F/G \to F/G$.

1-successors don't give any new info, but 0-succ. do.

$(AB) \to (FG)$

$(CDE) \to BCD$.

$\Rightarrow P_2 = (AB)(CDE)(FG)$.

$P_3 = (AB)(C)(DE)(FG)$ as C's successors are in a different partition than DE's successors.

Similarly, $D/E \xrightarrow{0} C/D$.

$P_4 = (AB)(C)(D)(E)(FG)$

$P_5 = P_4$. so $A=B$ & $F=G$

Q3

$P_0 = (ABCDE)$

$P_1 = (ABE)(CD)$

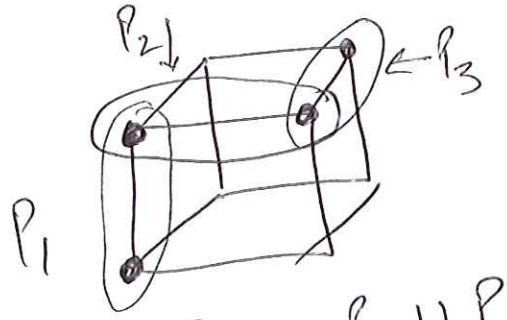
$P_2 = (A)(BE)(CD)$

$P_3 = (A)(BE)(C)(D) = P_4$

Q5 (a) False, minterm $\neq$ sum of literals
$=$ product " "

(b) yes, that's what K-maps are used for. Generate <u>all</u> primes, & then pick a min # of primes that cover the function.

(c) True.



$P_2 = P_1 \cup P_3$

(d) False. XOR = not enough on its own.

But AND-XOR = universal.

$$\left[\begin{array}{l} a \vee b = a \oplus b \oplus ab. \\ \bar{a} = a \oplus 1 \end{array}\right]$$

Q5.

$$f(a,b,c,d) = \sum(1,2,4,7,8,11,13,14)$$

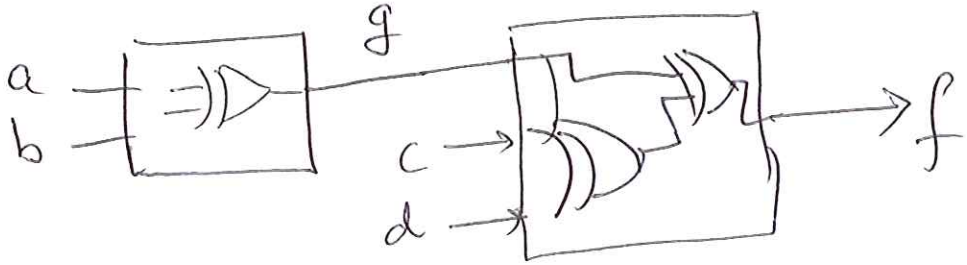
decompose as $f(g(a,b), c, d)$.

ab \ cd	00	01	11	10
00	0 (0)	1 (1)	0 (3)	1 (2)
01	1 (4)	0 (5)	1 (7)	0 (6)
11	0 (12)	1 (13)	0 (15)	1 (14)
10	1 (8)	0 (9)	1 (11)	0 (10)
	$\downarrow$ g	$\downarrow$ $\bar{g}$	$\downarrow$ g	$\downarrow$ $\bar{g}$

$$g = \bar{a}b + a\bar{b} = a \oplus b.$$

$$f = \bar{c}\bar{d}\cdot g + \bar{c}d\cdot\bar{g} + cd\cdot g + c\bar{d}\cdot\bar{g}$$

$$= g(c \bar{\oplus} d) + \bar{g}(c \oplus d) = g \oplus (c \oplus d)$$



Q 6.

$$f = (\overline{A} + \overline{B}) \cdot (\overline{C} + \overline{D})$$

$$= (\overline{A \cdot B}) \cdot (\overline{CD})$$

$$= \overline{AB + CD}$$

$AB+CD \rightsquigarrow$ PDN.

& PUN = Dual of PDN.