

Practice Problem 4  
Solutions

1.  $F1(X,Y,Z) = X'.Z' + X.Y' + Y.Z$   
 $F2(X,Y,Z) = X'.Y + X.Z + Y'.Z'$

$$\begin{aligned} F1(X,Y,Z) &= X'.Z'.(Y+Y') + X.Y'.(Z+Z') + Y.Z.(X+X') \\ &= X'.Y.Z' + X'.Y'.Z' + X.Y'Z + X.Y'Z' + X.Y.Z + X'.Y.Z \\ &= \Sigma(0,2,3,4,5,7) \end{aligned}$$

$$\begin{aligned} F2(X,Y,Z) &= X'.Y.(Z+Z') + X.Z.(Y+Y') + Y'.Z'.(X+X') \\ &= X'.Y.Z + X'.Y.Z' + X.Y.Z + X.Y'.Z + X.Y'.Z' + X'.Y'.Z' \\ &= \Sigma(0,2,3,4,5,7) \end{aligned}$$

Both F1 and F2 have the same product terms in the canonical sum. Hence they are the same.

2. In  $F(X1,X2,X3,X4,X5)$ , considering  $X1$  to be the most significant bit (MSB) and  $X5$  to be the least significant bit (LSB), the following Kmap can be drawn.

		X1 X2 X3							
		000	001	011	010	110	111	101	100
X4 X5	00								
	01								
	11								
	10								

  

	00	01	11	10	00	01	11	10
00	0	4	12	8	24	28	20	16
01	1	5	13	9	25	29	21	17
11	3	7	15	11	27	31	23	19
10	2	6	14	10	26	30	22	18

On folding the Kmap about the shown axis, the two squares overlap each other. Hence the prime implicant covers 8 1s.

Thus  $F(X1,X2,X3,X4,X5) = X3X5$