

HW 6

$$2.5 \checkmark a) Y = \bar{A}\bar{B} + A\bar{B} + AB = A(\bar{B}+B) + \bar{A}\bar{B} = A + \bar{A}\bar{B} \\ = (A + \bar{A})(A + \bar{B}) = \boxed{A + \bar{B}}$$

$$\checkmark b) Y = \boxed{\bar{A}\bar{B}\bar{C} + ABC}$$

$$\checkmark c) Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + ABC \\ = \bar{B}\bar{C}(\bar{A}+A) + AC(\bar{B}+B) + \bar{A}B\bar{C} \\ = \bar{B}\bar{C} + AC + \bar{A}B\bar{C} \\ = \bar{C}(\bar{B} + \bar{A}B) + AC = \bar{C}(\bar{B} + \bar{A})(\bar{B} + B) + AC \\ = \boxed{\bar{C}\bar{B} + \bar{C}\bar{A} + AC}$$

$$d) Y = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD \\ + A\bar{B}\bar{C}\bar{D} + A\bar{B}C\bar{D} + ABC\bar{D} \\ = \bar{A}\bar{B}(\bar{C}\bar{D} + \bar{C}D + C\bar{D} + CD) + A\bar{B}\bar{D}(C + \bar{C}) \\ + ABC\bar{D} \\ = \bar{A}\bar{B}(\bar{C}(\bar{D}+D) + C(\bar{D}+D)) + A\bar{B}\bar{D} + ABC\bar{D} \\ = \bar{A}\bar{B}(\bar{C} + C) + A\bar{D}(\bar{B} + BC) \\ = \bar{A}\bar{B} + A\bar{D}(\bar{B} + B)(\bar{B} + C) \\ = \bar{A}\bar{B} + A\bar{B}\bar{D} + AC\bar{D} \\ = \bar{B}(\bar{A} + A\bar{D}) + AC\bar{D} \\ = \bar{B}(\bar{A} + A)(\bar{A} + \bar{D}) + AC\bar{D} \\ = \boxed{\bar{A}\bar{B} + \bar{B}\bar{D} + AC\bar{D}}$$

$$e) Y = \boxed{\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + \bar{A}B\bar{C}D + \bar{A}BCD \\ + A\bar{B}\bar{C}\bar{D} + A\bar{B}C\bar{D} + AB\bar{C}\bar{D} + ABCD}$$

2.13 a) $Y = AC + \bar{A}\bar{B}C = C(A + \bar{A}\bar{B}) = C(A + \bar{B})$
 $= AC + A\bar{B}$

	AB			
	00	01	11	10
C	0			
	1	1	1	1

b) $Y = \bar{A}\bar{B} + \bar{A}B\bar{C} + \overline{(A + \bar{C})} = \bar{A}\bar{B} + \bar{A}B\bar{C} + \bar{A}C$
 $= \bar{A}(\bar{B} + B\bar{C} + C) = \bar{A}((\bar{B} + B)(\bar{B} + C) + C)$
 $= \bar{A}(\bar{B} + \bar{C} + C) = \bar{A}(\bar{B} + 1) = \bar{A}$

	AB			
	00	01	11	10
C	0			
	1	1	0	0

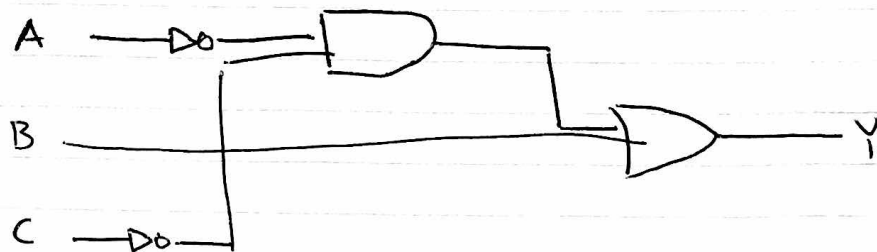
c) $Y = \bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C} + A\bar{B}C\bar{D} + AB\bar{D} + \bar{A}\bar{B}C\bar{D}$
 $+ B\bar{C}D + \bar{A} = \bar{A} + \bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C} + A\bar{B}C\bar{D}$
 $+ AB\bar{D} + \bar{B}C\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}(\bar{C}\bar{D} + A\bar{C} + AC\bar{D} + C\bar{D}) + AB\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}(\bar{D} + A\bar{C} + A\bar{D}) + AB\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}(\bar{D} + A\bar{C}) + AB\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}\bar{D} + A\bar{B}\bar{C} + AB\bar{D} + B\bar{C}D$
 $= \bar{A} + A(\bar{B}\bar{C} + \bar{B}D) + \bar{B}\bar{D} + B\bar{C}D$
 $= (\bar{A} + A)(\bar{A} + (\bar{B}\bar{C} + BD)) + \bar{B}\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}\bar{C} + BD + \bar{B}\bar{D} + B\bar{C}D$
 $= \bar{A} + \bar{B}\bar{C} + BD + \bar{B}\bar{D}$

	AB			
	00	01	11	10
CD	00			
	01	1	1	1
	11	1	1	0
	10	1	0	1

2.17 ✓ a)
$$Y = BC + \bar{A}\bar{B}\bar{C} + B\bar{C} = B(C + \bar{C}) + \bar{A}\bar{B}\bar{C}$$

$$= B + \bar{A}\bar{B}\bar{C} = (B + \bar{A})(B + \bar{B})(B + \bar{C})$$

$$= (\bar{A} + B)(B + \bar{C}) = \boxed{B + \bar{A}\bar{C}}$$



✓ b)
$$Y = \overline{A + \bar{A}B + \bar{A}\bar{B}} + \overline{A + \bar{B}}$$

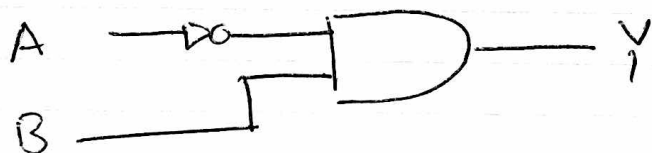
$$= \overline{A + \bar{A}(B + \bar{B})} + \overline{A + \bar{B}}$$

$$= \overline{A + \bar{A}} + \bar{A}B$$

$$= (1) + \bar{A}B$$

$$= 0 + \bar{A}B$$

$$= \boxed{\bar{A}B}$$



2.25

$$Y = ABCD + A\bar{B}C + A\bar{C}D + \bar{A}D$$

$$Z = BD + A\bar{C}D$$

Y

		AB				
		00	01	11	10	
CD	00					
	01	1	1	1	1	
	11	1	1	1	1	
	10				1	

✓

$$Y = D + A\bar{B}C$$

Z

		AB				
		00	01	11	10	
CD	00					
	01		1	1	1	
	11		1	1		
	10					

✓

$$Z = BD + A\bar{C}D$$

2.34 a) S_d

			$D_{3:2}$			
		$D_{1:0}$	00	01	11	10
	00		1	0	0	1
	01		0	1	0	0
	11		1	0	0	0
	10		1	1	0	0

✓

$$S_d = \bar{D}_3 \bar{D}_2 D_1 + \bar{D}_3 D_1 \bar{D}_0 + \bar{D}_2 D_1 D_0 + \bar{D}_3 D_2 \bar{D}_1 D_0$$

b) S_d $D_{3:2}$

$D_{1:0}$	00	01	11	10
00	1	0	X	1
01	0	1	X	0
11	1	0	X	X
10	1	1	X	X

$$\sqrt{S_d = \bar{D}_2 \bar{D}_0 + D_1 \bar{D}_0 + D_2 \bar{D}_1 D_0 + \bar{D}_2 D_1}$$