

## CSE 370 – Winter 2008

### Homework 1 – Solutions

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- 1) a) 8      b) 108      e) 512      f) 83      h) 4096      i) 942  
 2) a) 110101    i) F0  
 3) b) 100 000 111 111    f) 1000 1111 1100  
 4) a) 101101    f) 100101001  
 5) a) 11111    f) 10 1011  
 6) Select 2 Bits to encode the suit (00 = ♦, 01 = ♥, 10 = ♣, 11 = ♠) and 4 Bits to encode the value (1 = Ace, ..., 13 = King, 0, 14, 15 are invalid codes)

Encoding 1:  $s_1 s_0 | v_3 v_2 v_1 v_0$  , Encoding 2:  $v_3 v_2 v_1 v_0 | s_1 s_0$

$$C_{Jack, Diamond} = \overline{s_1} \overline{s_2} v_3 \overline{v_2} v_1 v_0$$

$$C_{Seven, * } = \overline{v_3} v_2 v_1 v_0$$

$$C_{*, Hearts} = \overline{s_2} s_1 \wedge (\overline{v_3} \overline{v_2} \overline{v_1} \overline{v_0}) \wedge (v_3 v_2 v_1)$$

**\*For Encoding 2 bits are just reordered**

*Several other correct solutions exist for this problem.*

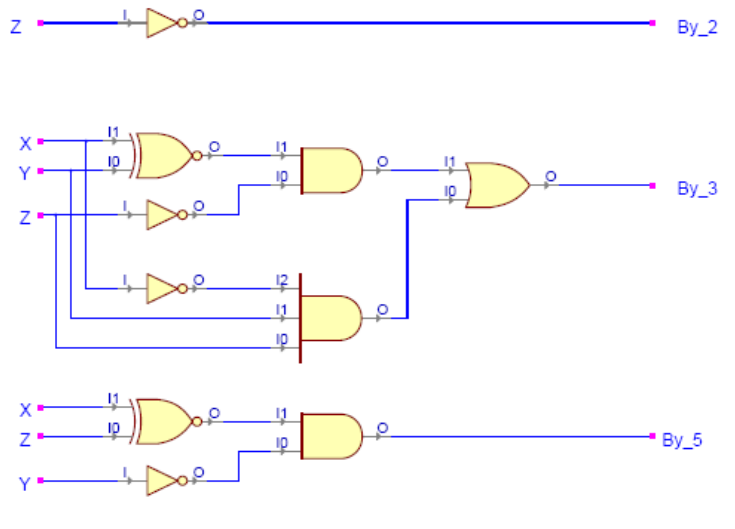
7)

$C$	$B$	$A$	$Z_a$	$Z_b$	$Z_c$
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	0	1
0	1	1	0	1	1
1	0	0	0	0	1
1	0	1	0	1	1
1	1	0	0	1	1
1	1	1	1	1	1

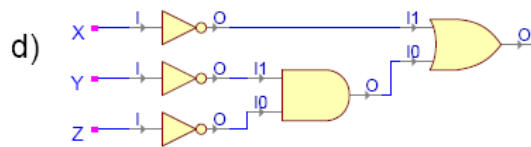
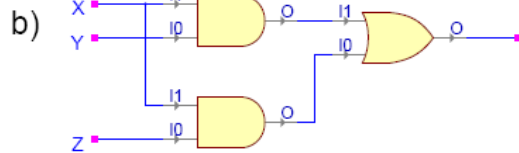
8)  $By_2 = \bar{Z}$

$$By_3 = \bar{X}\bar{Y}\bar{Z} \vee \bar{X}YZ \vee X\bar{Y}\bar{Z} = (\bar{X}\bar{Y} \vee XY)\bar{Z} \vee \bar{X}YZ = (X \equiv Y)\bar{Z} \vee \bar{X}YZ$$

$$By_5 = \bar{X}\bar{Y}\bar{Z} \vee X\bar{Y}Z = \bar{Y}(\bar{X}\bar{Z} \vee XZ) = \bar{Y}(X \equiv Z)$$



9)



10)b) Show that  $X(X \vee Y) = X$

$$X(X \vee Y) = XX \vee XY = X \vee XY = X1 \vee XY = X(1 \vee Y) = X1 = X \quad \text{q.e.d}$$

d) Show that  $(X \vee Y)(\bar{X} \vee Z) = XZ \vee \bar{X}Y$

$$\begin{aligned} (X \vee Y)(\bar{X} \vee Z) &= X\bar{X} \vee XZ \vee Y\bar{X} \vee YZ = 0 \vee XZ \vee Y\bar{X} \vee YZ = XZ \vee Y\bar{X} \vee YZ \\ &= XZ \vee Y\bar{X} \vee YZ1 = XZ \vee Y\bar{X} \vee YZ(X \vee \bar{X}) = XZ \vee Y\bar{X} \vee YZX \vee YZ\bar{X} \\ &= XZ(1 \vee Y) \vee \bar{X}Y(1 \vee Z) = XZ \vee \bar{X}Y \quad \text{q.e.d} \end{aligned}$$

11)b)

A	B	$A \vee \bar{B}$	$(A \vee \bar{B})B$	AB
0	0	1	0	0
0	1	0	0	0
1	0	1	0	0
1	1	1	1	1

The LHS and RHS columns are equal ✓

c)

A	B	C	$A \vee B$	$\bar{A} \vee C$	AC	$\bar{A}B$	$(A \vee B)(\bar{A} \vee C)$	$AC \vee \bar{A}B$
0	0	0	0	1	0	0	0	0
0	0	1	0	1	0	0	0	0
0	1	0	1	1	0	1	1	1
0	1	1	1	1	0	1	1	1
1	0	0	1	0	0	0	0	0
1	0	1	1	1	1	0	1	1
1	1	0	1	0	0	0	0	0
1	1	1	1	1	1	0	1	1

The LHS and RHS columns are equal ✓

12)e)  $\overline{(X \vee Y)Z} = \overline{(X \vee Y)} \vee Z = (\bar{X} \wedge \bar{Y}) \vee Z$

f)  $\overline{X \vee YZ} = \bar{X} \wedge \overline{YZ} = \bar{X} \wedge \bar{Y}Z$

### Grading Breakdown:

1. Half point per sub-division.	3
2. 1 point per sub-division.	1
3. Not Graded	X
4. Not Graded	X
5. 1 point per sub-division.	1
6. 6 points. Encodings – 3points. Specific Codes – 3points	6
7. Not Graded	X
8. Not Graded	X
9. 4 points. 2 points pre sub-division.	4
10. 5 points. Part d: 2 points. Part d: 3 points.	5
11. Not Graded	X
12. Not Graded	X

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Total

20

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