Homework 2

Chapter 3:
Problems: 2,30,35,42,43,47

Chapter 4:
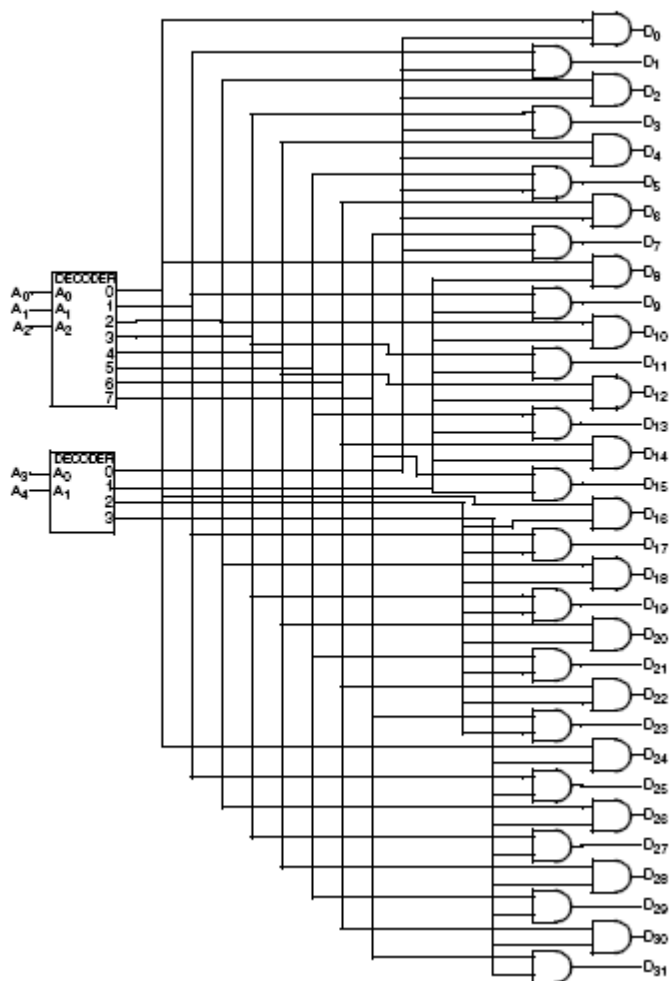Problems: 2, 3,6,16

Solution:
3-2
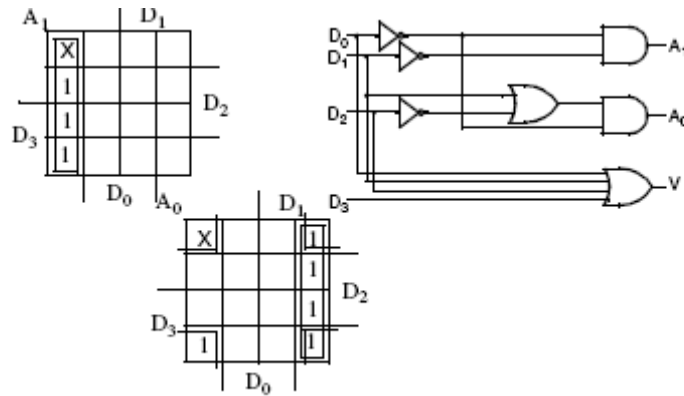

$F = AB + AC$
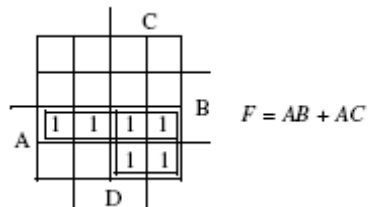
3-30

3-35

D_3	D_2	D_1	D_0	A_1	A_0	V
0	0	0	0	X	X	0
X	X	X	1	0	0	1
X	X	1	0	0	1	1
X	1	0	0	1	0	1
1	0	0	0	1	1	1

$V = D_0 + D_1 + D_2 + D_3$

$A_0 = \overline{D_0}(D_1 + \overline{D_2})$

$A_1 = \overline{D_0}\,\overline{D_1}$

3-42
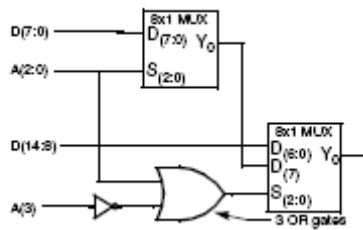
3-43

A_1	A_0	E	D_0	D_1	D_2	D_3
0	0	0	0	0	0	0
0	0	1	1	0	0	0
0	1	0	0	0	0	0
0	1	1	0	1	0	0
1	0	0	0	0	0	0
1	0	1	0	0	1	0
1	1	0	0	0	0	0
1	1	1	0	0	0	1

Consider E as the data input and A0, A1 as the select lines. For a given combination on (A1, A0), the value of E is distributed to the corresponding D output. For example for (A1, A0) = (10), the value of E appears on D2, while all other outputs have value 0.
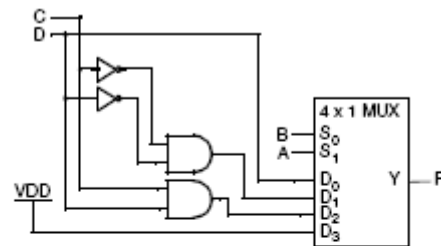
3-47

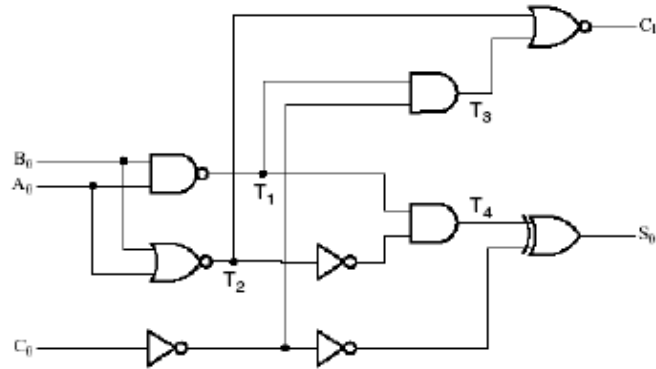| A	B	C	D	F	
0	0	0	0	0	
0	0	0	1	1	F=D
0	0	1	0	0	
0	0	1	1	1	
0	1	0	0	1	
0	1	0	1	0	$F=\overline{C}\,\overline{D}$
0	1	1	0	0	
0	1	1	1	0	
1	0	0	0	0	
1	0	0	1	0	F=C D
1	0	1	0	0	
1	0	1	1	1	
1	1	0	0	1	
1	1	0	1	1	F=1
1	1	1	0	1	
1	1	1	1	1	

4-2

$$C_1 = \overline{T_3 + T_2} = \overline{T_1 \overline{C_0} + T_2} = \overline{\overline{A_0 B_0}\, \overline{C_0} + \overline{A_0 + B_0}} = \overline{(\overline{A_0} + \overline{B_0})\overline{C_0} + \overline{A_0}\,\overline{B_0}} = (A_0 B_0 + C_0)(A_0 + B_0)$$

$$C_1 = A_0 B_0 + A_0 C_0 + B_0 C_0$$

$$S_0 = C_0 \oplus T_4 = C_0 \oplus T_1 \overline{T_2} = C_0 \oplus \overline{A_0 B_0}(A_0 + B_0) = C_0 \oplus (\overline{A_0} + \overline{B_0})(A_0 + B_0) = C_0 \oplus A_0 \overline{B_0} + \overline{A_0} B_0$$

$$S_0 = A_0 \oplus B_0 \oplus C_0$$

(circuit diagram with gates producing C_1, T_3, T_4, S_0 from inputs B_0, A_0, C_0 via intermediate signals T_1, T_2)

4-3

Obtain the 1s and 2s complement of the following unsigned binary numbers:
1001 1100, 1001 1101 ,1010 1000 , 0000 0000 , 1000 0000

Unsigned	1001 1100	1001 1101	1010 1000	0000 0000	1000 0000
1's Complement	0110 0011	0110 0010	0101 0111	1111 1111	0111 1111
2's Complement	0110 0100	0110 0011	0101 1000	0000 0000	1000 0000

4-6

Perform the arithmetic operations +36 + (-24) and -35 – (-24) in binary using signed 2s complement representation for negative numbers.

```
    36               0100100
  +(–24)        +    1101000
                    10001100
   = 12         =    0001100


   –35               1011101
  - (–24)       +    0011000
   = –11        =    1110101
```

4-16

The adder-subtractor circuit in fig 4-7 has the following values input select S and data inputs A and B. Determine in each case the values of the outputs S3.S2,S1,S0 and C4.

	S	A	B
a	0	0111	0111
b	1	0100	0111
c	1	1101	1010
d	0	0111	1010
e	1	0001	1000

	S	A	B	C₄	S₃	S₂	S₁	S₀
a)	0	0111	0111	0	1	1	1	0
b)	1	0100	0111	0	1	1	0	1
c)	1	1101	1010	1	0	0	1	1
d)	0	0111	1010	1	0	0	0	1
e)	1	0001	1000	0	1	0	0	1