3.14 (2 points)

A 16 input multiplexer will have one output line. It will have 4 select lines.

3.15 (10 points)

C_{in}	1	1	1	0
A	0	1	1	1
B	1	0	1	1
S	0	0	1	0
C_{out}	1	1	1	1

$A = 7$, $B = 11$, $A + B = 18$. In the above calculation, the result (S) is 2!! This is because 18 is too large a number to be represented in 4 bits. Hence there is an overflow - Cout[3] = 1.
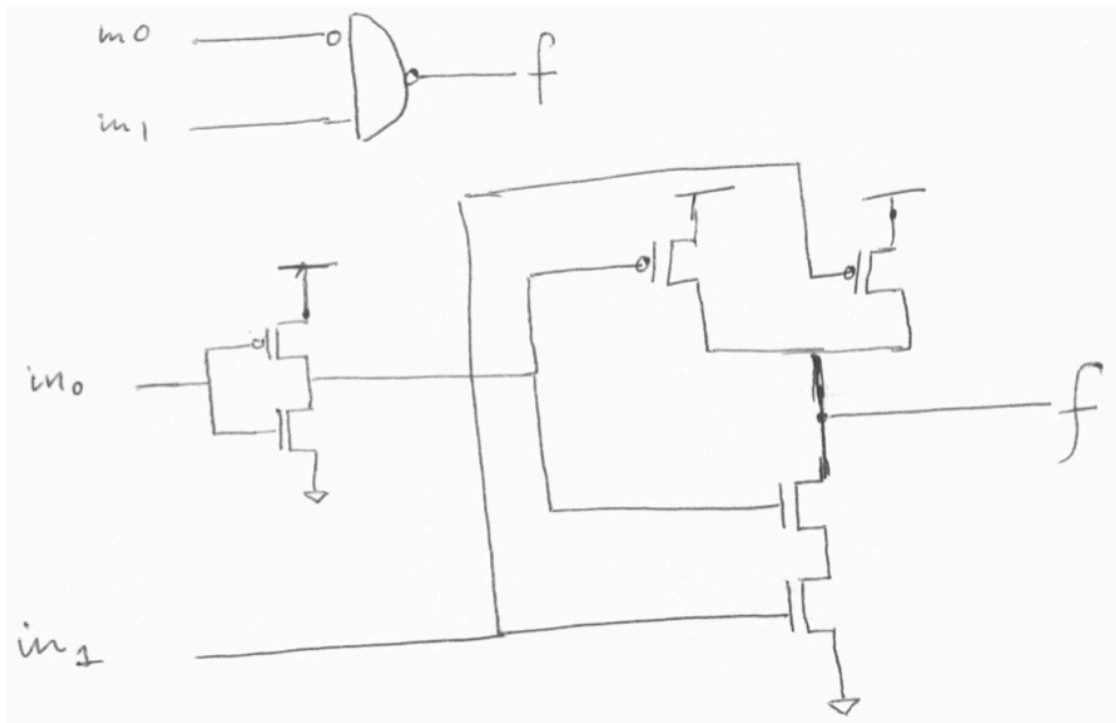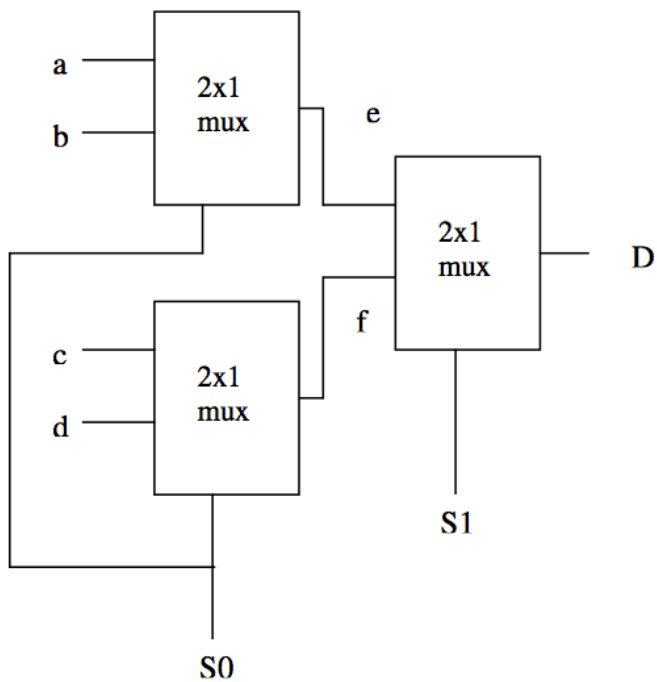
3.16. (12 points)

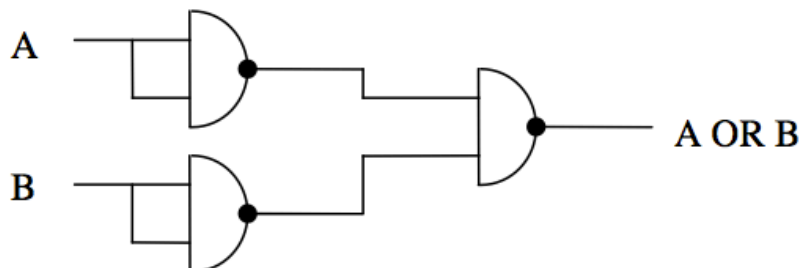Z = XNOR(A,B,C)
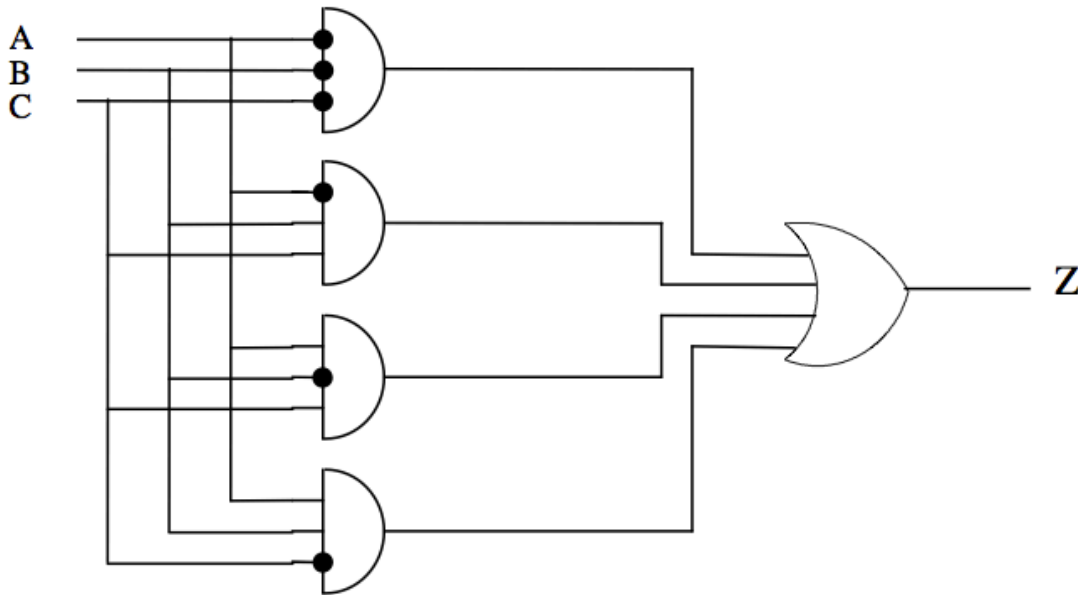
3.20 (10 points)

3.22 (15 points)

S1	S0		e	f	D
0	0		a	c	a
0	1		b	d	b
1	0		a	c	c
1	1		b	d	d

3.23 (10 points)

A	B	C		Z
0	0	0		0
0	0	1		0
0	1	0		0
0	1	1		0
1	0	0		0
1	0	1		0
1	1	0		0
1	1	1		0

....

3.44 (6 points)

A
B
A AND B

A
NOT A

A
B
A OR B

....
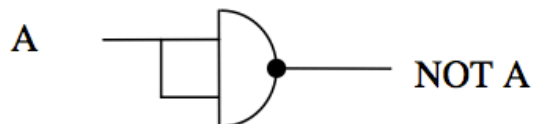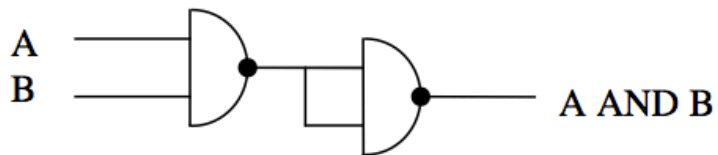
Custom Problem 1: (**20 points**)
Normal (Non-E.C version)

NORMAL VERSION
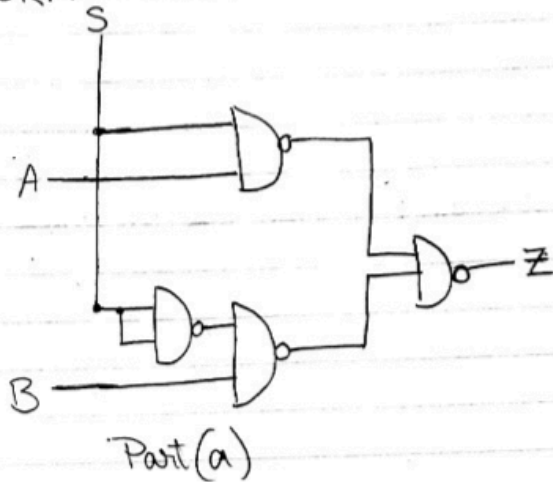
A	B	If S=0, Z	If S=1, Z
0	0	0	0
0	1	1	0
1	0	0	1
1	1	1	1

∴ if S=0, Z=B
if S=1, Z=A

Part (b)

Part (a)

E.C. Version: **(22.5 points -20 for normal and 2.5 extra because this is EC)**

EXTRA CREDIT VERSION
Part (a)
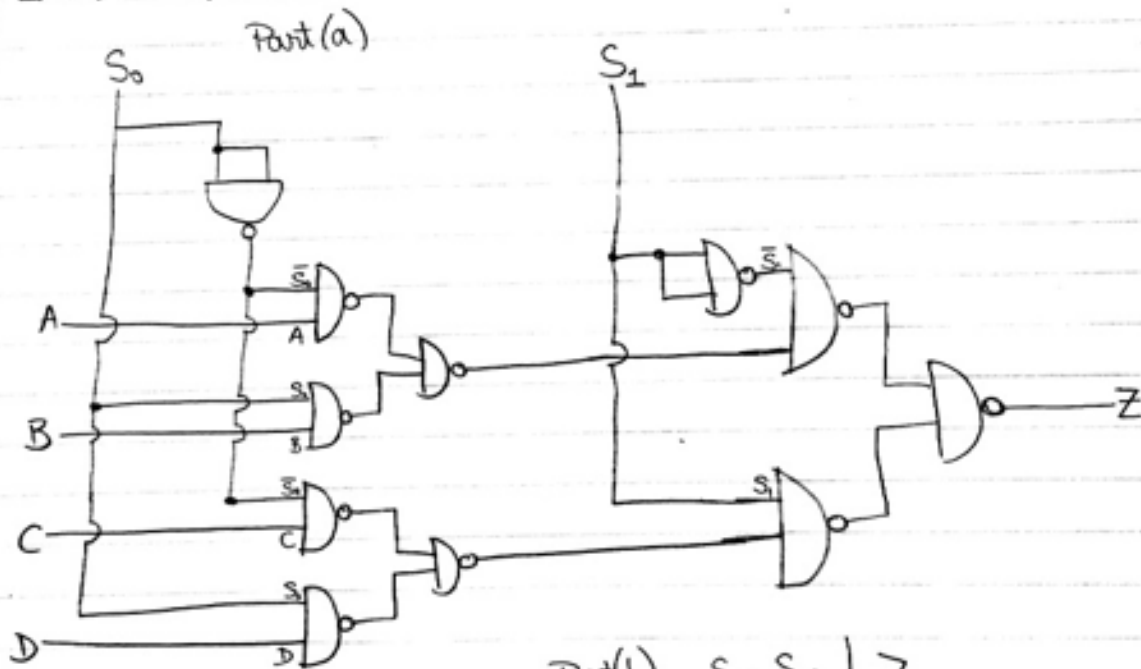
Part(b)

S_0	S_1	Z
0	0	A
0	1	C
1	0	B
1	1	D

. . . .

Custom Problem 2: **(15 points – 5each)**

$$AB + A\bar{B} = A(B + \bar{B}) \quad \text{By distributive law}$$
$$= A1 \quad \text{Since } (B + \bar{B}) = 1$$
$$= A \quad \text{Since } (A1) = A$$

$$(A + B)(A + \bar{B}) = A + (B\bar{B}) \quad \text{By distributive law}$$
$$= A + 0 \quad \text{Since } (B\bar{B}) = 0$$
$$= A \quad \text{Since } A + 0 = A$$

$$A(A + B) = AA + AB \quad \text{By distributive law}$$
$$= A + AB \quad \text{Since } AA = A$$
$$= A(1 + B) \quad \text{By distributive law}$$
$$= A1 \quad \text{Since } (1 + B) = B$$
$$= A$$

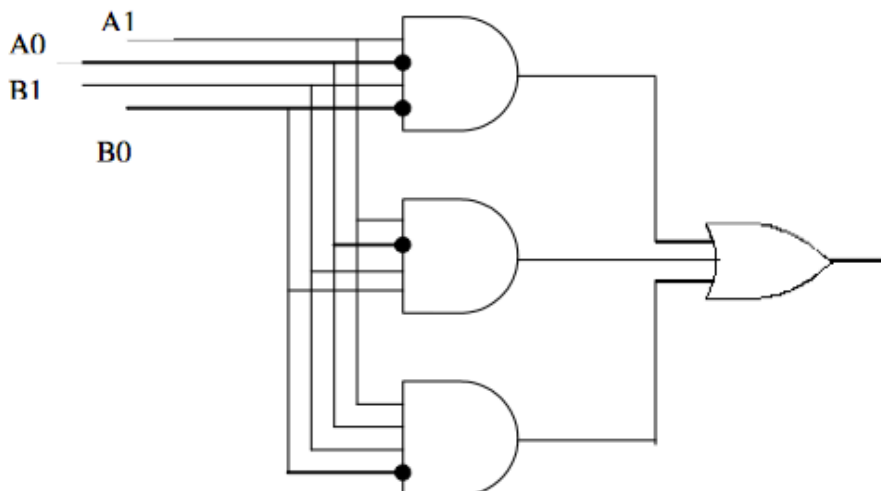..

EXTRA CREDIT: **(2.5 points – as specified by the question) NOTE: for EC, its either all or nothing**
3.28:
- a) 3
- b) 3
- c) 9
- d) 4

e)

A[1]	A[0]	B[1]	B[0]		Y[3]	Y[2]	Y[1]	Y[0]
0	1	0	1		0	0	0	1
0	1	1	0		0	0	1	0
0	1	1	1		0	0	1	1
1	0	0	1		0	0	1	0
1	0	1	0		0	1	0	0
1	0	1	1		0	1	1	0
1	1	0	1		0	0	1	1
1	1	1	0		0	1	1	0
1	1	1	1		1	0	0	1

f) $Y_2 = A_1.A_0'.B_1.B_0' + A_1.A_0'.B_1.B_0 + A_1.A_0.B_1.B_0'$

EXTRA CREDIT Q2: (2.5 points – as specified by the question) NOTE: for EC, its either all or nothing