Heimadæmi04 Greining og Hönnun stýrikerfa TÖV201G

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4.2 Obtain the simplified Boolean expression

Obtain the simplified boolean expression for output F and G in terrms of the input variables in the circuit of Fig P4.2

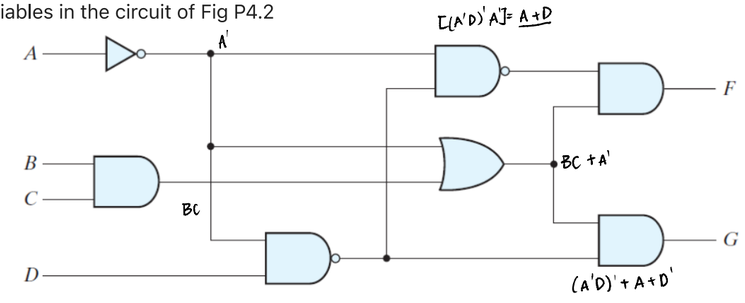
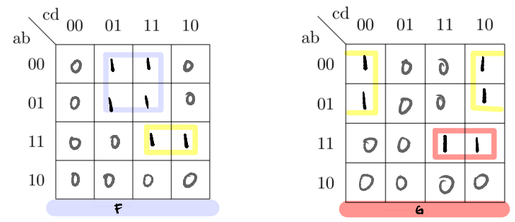


FIGURE P4.2

Lausn 4.2

- **F =** (A + D)(A' + BC) = A'D + ABC
- **G =** (A + D')(A' + BC) = A'D' + ABC + BCD' = A'D' + ABC



- **F =** A'D + ABC + BCD = A'D + ABC
- **G =** (A + D)(A' + BC) = A'D' + ABC

4.13 Adder-subtractor circiut

The Adder-sub of circuit Fig.4.13 has the following values for mode inout M and data inputs A and B.

Glósur:

Í binary;
1= 01
2= 10
3= 11

M;

Ef M er 0 helst b3,b2,b1,b0 - óbreytt
Ef M er 1 breytist b3,b1,b2,b0 - í akkúrat öfugt. Ss ef b1 er 1 þá breytist það í 0 ss öfugt.

Er overflow eða ekki?

Ef c4 + c3 = 0 tha er ekki overflow og ofugt

4.13 Adder-subtractor circiut

The Adder-sub of circuit Fig.4.13 has the following values for mode inout M and data inputs A and B.

	M	A	B
(a)	0	0111	0110
(b)	0	1000	1001
(c)	1	1100	1000
(d)	1	0101	1010
(e)	1	0000	0001

In each case, **determine** the values of the four **SUM**, the **carry C** and the **overflow V**.

Lausn 4.13

a)

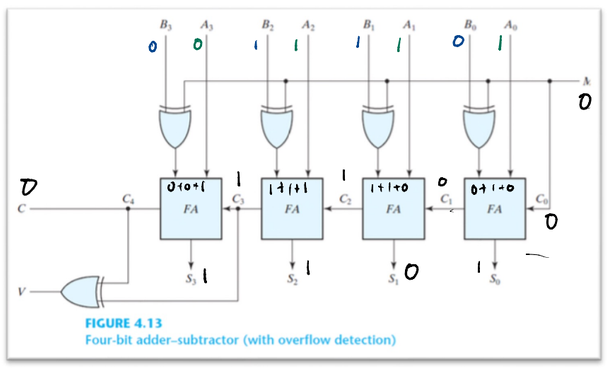


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

b)

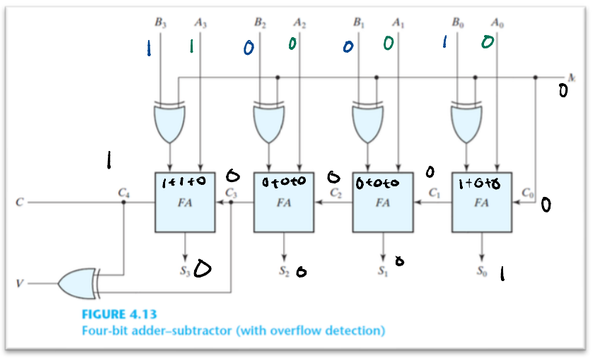


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

c)

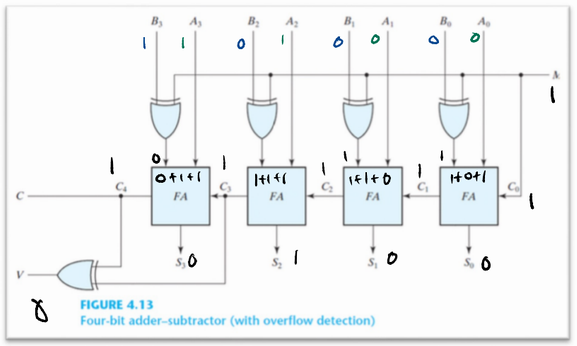


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

d)

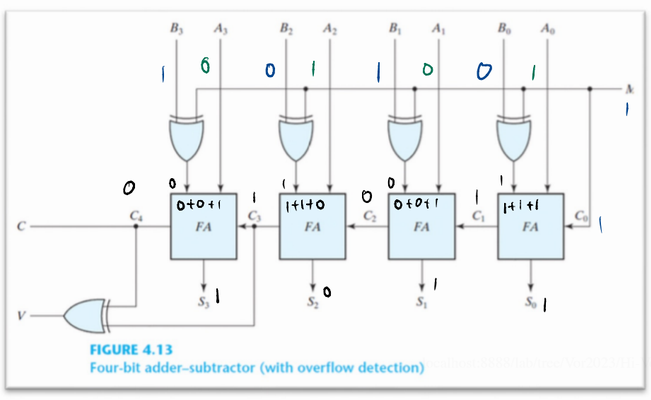


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

e)

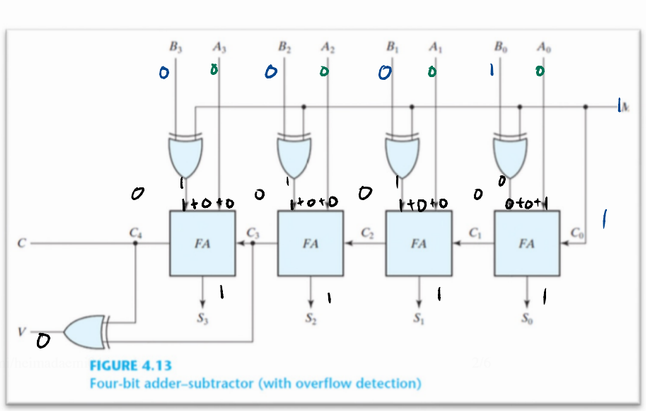


FIGURE 4.13
Four-bit adder–subtractor (with overflow detection)

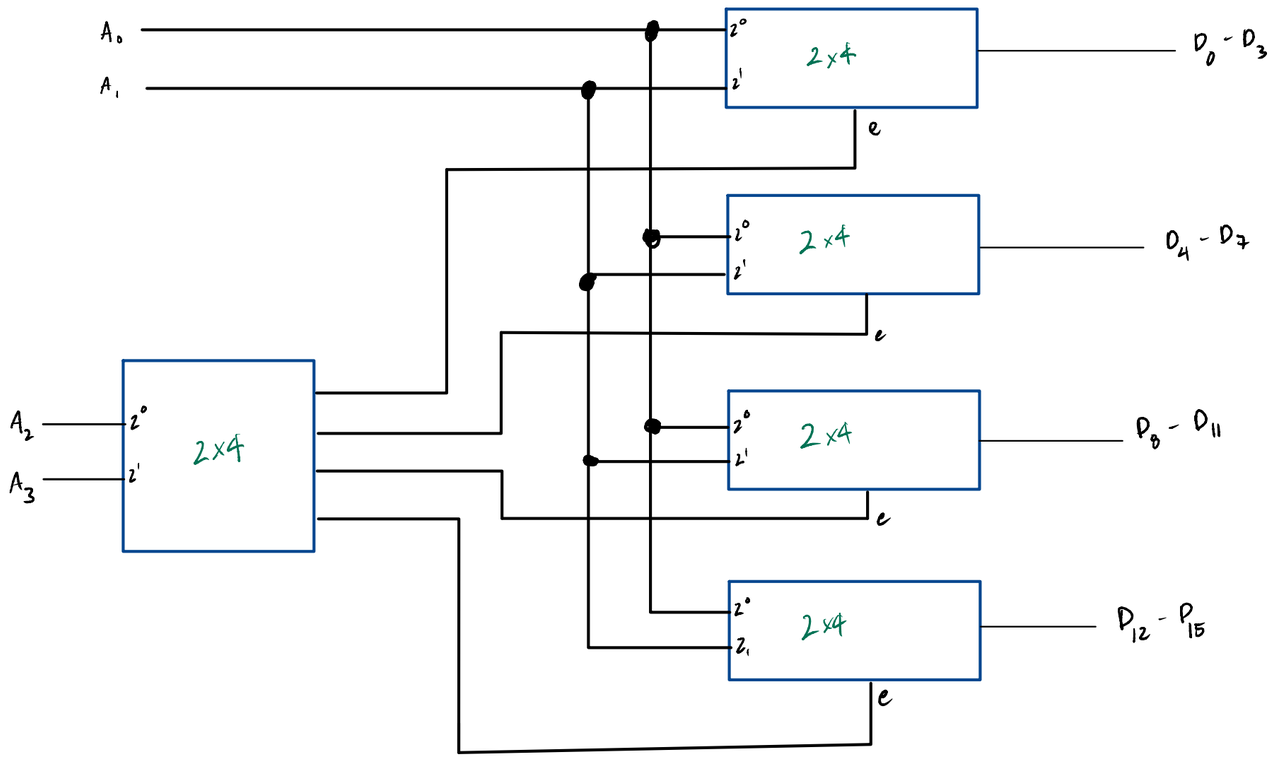
Svörin;

	sum	C	V
a)	1101	0	1
b)	0001	1	1
c)	0100	1	0
d)	1011	0	1
e)	1111	0	0

4.26 Construct

Construct a 4-to-16-line code with five 2-to-4 decoders with enable

Lausn 4.26



4.28 decoder, external gates - design combinational circuit

- Using the decoder and external gates, design the combinational circuit defined by the following three Boolean functions

(a) $F_1 = x'yz' + xz$
$F_2 = xy'z' + x'y$
$F_3 = x'y'z' + xy$

(b) $F_1 = (y' + x)z$
$F_2 = y'z' + x'y + yz'$
$F_3 = (x + y)z$

Lausn 4.28

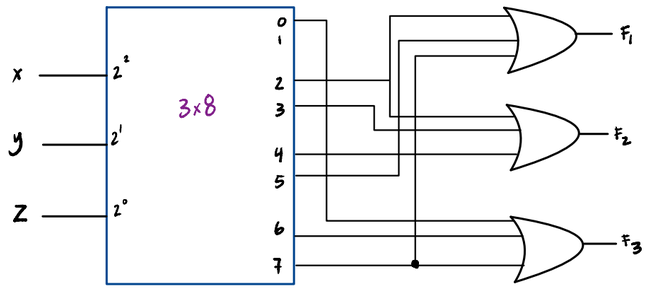
- A)

(a) $F_1 = x'yz' + xz$
$F_2 = xy'z' + x'y$
$F_3 = x'y'z' + xy$

X	Y	Z	F1.	F2.	F3
0	0	0	0	0	1
0	0	1	0	0	0
0	1	0	1	1	0
0	1	1	0	1	0
1	0	0	0	1	0
1	0	1	0	0	1
1	1	0	0	1	0
1	1	1	1	0	1

F1 (x,y,z) = Σ(2,5,7)
F2 (x,y,z) = Σ(2,3,4)
F3 (x,y,z) = Σ(0,6,7)

Inputs = 3x8 line decoder
Outputs = 3 OR gates (NOR ef þess þarf)



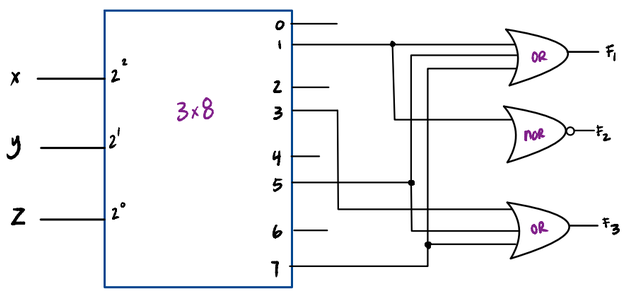
- B)

(b) $F_1 = (y' + x)z$
$F_2 = y'z' + x'y + yz'$
$F_3 = (x + y)z$

X	Y	Z	F1.	F2.	F3
0	0	0	0	1	0
0	0	1	1	0	0
0	1	0	0	1	0
0	1	1	0	1	1
1	0	0	0	1	0
1	0	1	1	0	1
1	1	0	0	1	0
1	1	1	1	0	1

F1 (x,y,z) = Σ(1,5,7)
F2 (x,y,z) = Σ(0,2,3,4,6) F´2 (x,y,z) = Σ(1,5,7)
F3 (x,y,z) = Σ(3,5,7)

Inputs = 3x8 line decoder
Outputs = 3 OR gates (Nor ef þess þarf)



S1 = 1 ef bíll of langur annnars 0
S2 = 1 ef mannneskja í bíl annnars 0
S3 = 1 ef bíll er ofan á annars 0
START = kveikja
Svo S1´*S2´*S3*START = Pressa. a)

S1	S2	S3	START	Pressa
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

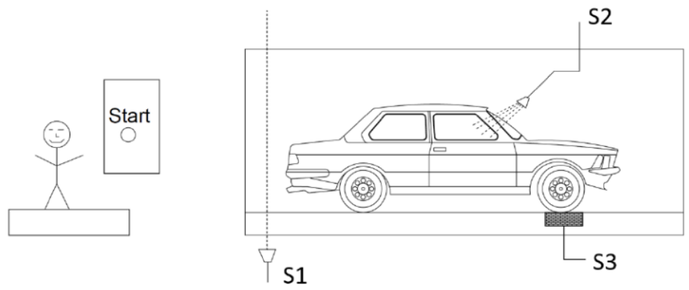
4.A0

4. A0 Hér að neðan er skissa af kerfi sem pressar bíla (t.d bílum sem er fargað). Þú átt að hanna stýringu fyrir kerfið skv eftirfarandi upplýsingum:

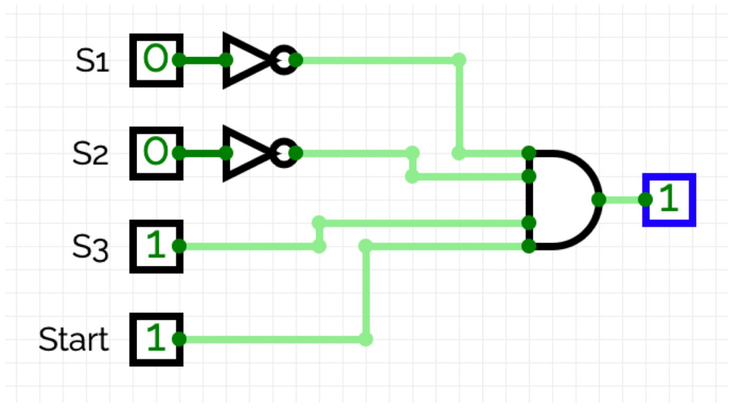
- S1 skynjar hvort bíll sé of langur fyrir pressuna. Hann gefur frá sér **1** ef bíl er of langur (fer yfir brotalínu S1), og gefur svo **0** ef bíllinn er ekki of langur (bíllinn fer ekki yfir brotalínu S1).
- S2 skynjar hvort manneskja sé í bílnum eða ekki. S2 gefur frá sér **1** ef það er manneskja í bílnum, og gefur frá sér **0** ef manneskja er ekki í bílnum.
- S3 er skynjari fyrir þyngd. Ef bíl er lagt ofan á skynjaranum S3 gefur hann frá sér 1, ef enginn bíll er á skynjaranum S3 gefur hann frá sér 0.

Til að kveikja á pressunni (og byrja að pressa bílinn) er ýtt á START hnapp. Pressan fer þó ekki í gang nema að eftirfarandi skilyrðum hafi verið náð:
1. Enginn er í bílnum (S2)
2. Bíllinn er ekki of langur (S1)
3. Þyngarskynjarinn skynjar að bíll sé í pressunni (S3)

a. Búið til sannleikstöflu fyrir kerfið, fáið boolean jöfnu fyrir kerfið og einfaldið hana ef mögulegt er
b. Teiknið upp rásarmyndina fyrir kerfið (boolean lausnina)

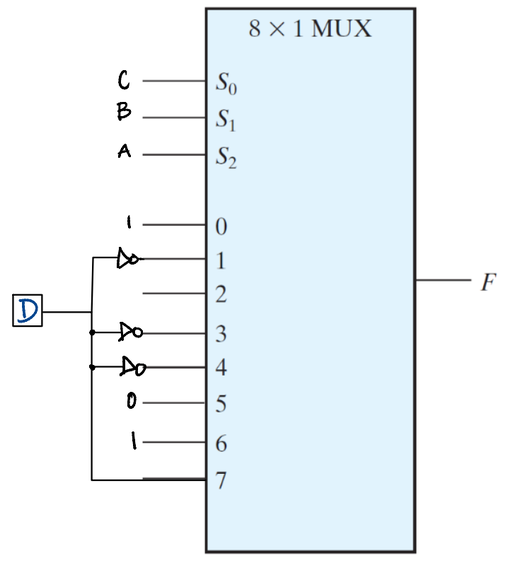


Lausn 4.A0



4.A1

4. A1 Útfærðu fallið $\mathrm{F}(A, B, C, D) = \sum(0,1,2,5,6,8,12,13,15)$ með 8x1 fjölrásara (e. Multiplexer).



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