

Dugga 2: Boolesk algebra och kombinatoriska nät

För godkänt på duggan krävs minst 7 poäng.

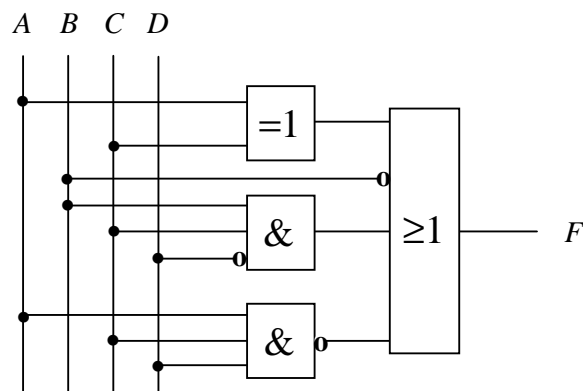
1. Expandera det booleska uttrycket $\bar{X}_2 + X_3\bar{X}_1$ till

a) SP normalform

b) PS normalform

(2 p)

2.



a) Ange det logiska uttrycket för F och ställ upp en sanningstabell.

b) Förenkla det logiska uttrycket för F , antingen genom användande av Boolesk algebra eller Karnaughdiagram. Rita det förenklade grindnätet.

(4 p)

3. Konstruera ett kombinatoriskt nät som fungerar enligt vidstående sanningstabell. Nätet skall vara så litet som möjligt och realiserat enbart med användande av

- a) NAND-grindar
b) NOR-grindar

A	B	C	D	E	Y
0	0	0	0	0	0
0	0	0	0	1	0
0	0	0	1	0	0
0	0	0	1	1	0
0	0	1	0	0	0
0	0	1	0	1	1
0	0	1	1	0	0
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	0	1	0
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0	1	1	1	0	0
0	1	1	1	1	1
1	0	0	0	0	0
1	0	0	0	1	1
1	0	0	1	0	0
1	0	0	1	1	1
1	0	1	0	0	1
1	0	1	0	1	1
1	0	1	1	0	1
1	0	1	1	1	1
1	1	0	0	0	0
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1	1	0	1	0	0
1	1	0	1	1	1
1	1	1	0	0	1
1	1	1	0	1	1
1	1	1	1	0	1
1	1	1	1	1	1

(4 p)

Boolesk algebra

Satser för en variabel:

$$A + A = A$$

$$A \cdot A = A$$

$$A + \overline{A} = 1$$

$$A \cdot \overline{A} = 0$$

$$A + 1 = 1$$

$$A \cdot 0 = 0$$

$$A + 0 = A$$

$$A \cdot 1 = A$$

$$\overline{\overline{A}} = A$$

Satser för flera variabler:

$$A + (B + C) = (A + B) + C$$

$$A(BC) = (AB)C$$

Associativa
lagarna

$$A + B = B + A$$

$$AB = BA$$

Kommutativa
lagarna

$$A(B + C) = AB + AC$$

$$A + (BC) = (A + B)(A + C)$$

Distributiva
lagarna

$$A + AB = A$$

$$A(A + B) = A$$

Absorptions-
lagarna

$$\overline{AB} + AC = \overline{A}B + AC + BC$$

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

Consensus-
lagarna

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

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

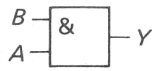
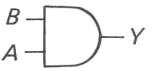
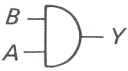
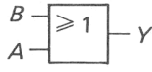

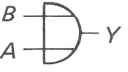
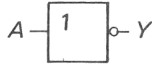
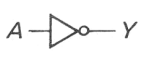

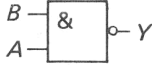
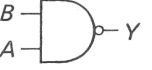
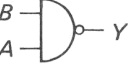
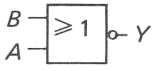
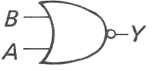
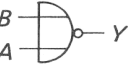
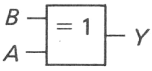
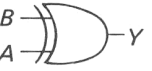
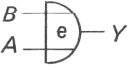

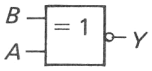
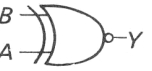
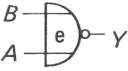

de Morgans
lagar

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

$$\overline{A \oplus B} = AB + \overline{A}\overline{B}$$

Omskrivning av EXOR
Omskrivning av EXNOR

Sammanställning av grindar som förekommer inom digitaltekniken

Funktion	Symbol			Funktions- tabell	Logiskt uttryck															
	IEC	Amerikansk	Äldre svensk																	
OCH AND				<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>Y</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	A	B	Y	0	0	0	0	1	0	1	0	0	1	1	1	$Y = A B$ $Y = A \wedge B$
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