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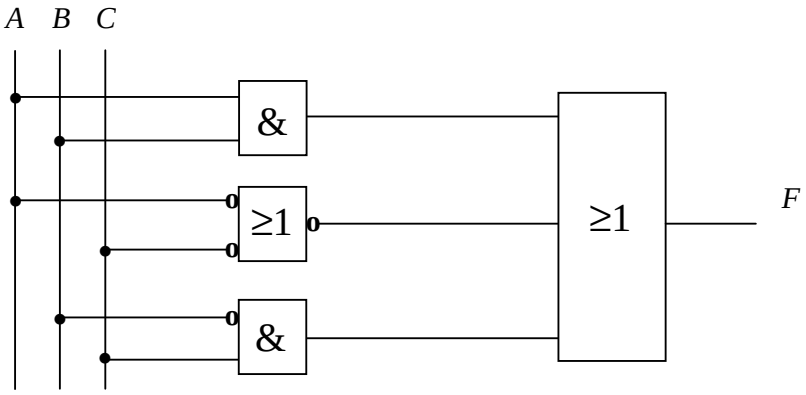
Linköpings universitet
INSTITUTE OF TECHNOLOGY

ISY/Datorteknik

Dugga 2: Boolesk algebra och kombinatoriska nät
Quiz 2: Boolean algebra and combinational circuits

1.



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

b) Förenkla det logiska uttrycket för *F*. Rita det förenklade grindnätet.

a) Give the expression for F and make a truth table.

b) Simplify the expression for F. Draw the simplified combinational circuit.

(6 p)

2. Konstruera ett kombinatoriskt nät med valfria grindar[1] som fungerar enligt vidstående sanningstabell. Nätet skall vara så litet som möjligt.

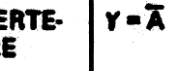
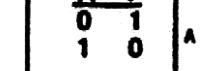
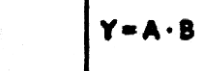
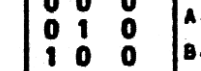
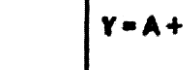
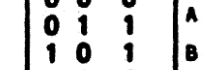
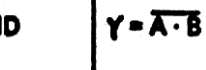
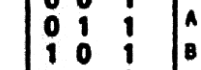
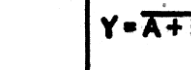
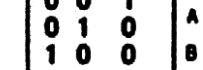
Realize a combinational circuit with optional gates [1] *according to the truth table besides. The circuit must be as small as possible.*

(4 p)

A	*B*	*C*	*D*	*E*	*F*
0	0	0	0	0	1
0	0	0	0	1	1
0	0	0	1	0	1
0	0	0	1	1	1
0	0	1	0	0	1
0	0	1	0	1	1
0	0	1	1	0	1
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	0	1	1
0	1	0	1	0	1
0	1	0	1	1	1
0	1	1	0	0	1
0	1	1	0	1	1
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	1
1	0	0	1	1	1
1	0	1	0	0	1
1	0	1	0	1	1
1	0	1	1	0	0
1	0	1	1	1	1
1	1	0	0	0	1
1	1	0	0	1	1
1	1	0	1	0	1
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

[1] AND, NAND, OR, NOR, EXOR, EXNOR & INVERTERS

$x + x = x$	
$x \cdot x = x$	
$x + \bar{x} = 1$	
$x \cdot \bar{x} = 0$	
$x + 1 = 1$	
$x \cdot 0 = 0$	
$x + 0 = x$	
$x \cdot 1 = x$	
$\bar{\bar{x}} = x$	
$x + (y + z) = (x + y) + z$	Associativ
$x(yz) = (xy)z$	Associativ
$x + y = y + x$	Kommutativ
$xy = yx$	Kommutativ
$x(y + z) = xy + xz$	Distributiv
$x + yz = (x + y)(x + z)$	Distributiv
$x + xy = x$	Absorbtion
$x(x + y) = x$	Absorbtion
$xy + \bar{x}z = xy + \bar{x}z + yz$	Consensus
$(x + y)(\bar{x} + z) = (x + y)(\bar{x} + z)(y + z)$	Consensus
$\overline{(x + y)} = \bar{x} \cdot \bar{y}$	De Morgan
$\overline{(xy)} = \bar{x} + \bar{y}$	De Morgan

Benämning	Funktion	Sannings-tabell	SYMBOL	
			Europeisk IEC 117-15	Amerikansk
INVERTE-RARE	$Y = \bar{A}$	A Y 0 1 1 0		
AND	$Y = A \cdot B$	A B Y 0 0 0 0 1 0 1 0 0 1 1 1		
OR	$Y = A + B$	A B Y 0 0 0 0 1 1 1 0 1 1 1 1		
NAND	$Y = \overline{A \cdot B}$	A B Y 0 0 1 0 1 1 1 0 1 1 1 0		
NOR	$Y = \overline{A + B}$	A B Y 0 0 1 0 1 0 1 0 0 1 1 0		
EX OR	$Y = A \oplus B$	A B Y 0 0 0 0 1 1 1 0 1 1 1 0