Kafrelsheikh University
Faculty of Computers & Information
Subject: Digital Circuits
Time Allowed: 3 Hours
Code: EE102

Full marks: 60
Date: 29/5/2018
Pages (2)

Answer the following questions

Question1: (10 points)

Check the following truth table, and then answer the questions following it.

X	Y	Z	F	
0	0	0	1	0
0	0	1	1	1
0	1	0	0	2
0	1	1	1	3
1	0	0	0	4
1	0	1	0	5
1	1	0	1	6
1	1	1	1	7

(a) Express the Boolean Function $F(X, Y, Z)$ in the sum of minterms form.

(b) Express the Boolean Function F(X, Y, Z) in the product of maxterms form.

(c) Simplify the function F(X, Y, Z) to its simplest form.

(d) Implement the digital circuit corresponding to F(X, Y, Z) using NAND gates only.

Question2: (10 points)

(a) Convert the hexadecimal number 64CD to binary, and octal.

(b) Simplify the following Boolean expression:

$$A'C' + ABC + AC'$$

Question3: (10 points)

(a) Design a four bits combinational circuit 2's complement (the output generates the 2's complement of the binary number).

(b) Prove that NOR is a universal gate.

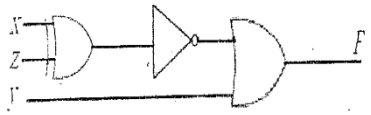
(باقى الأسئلة فى الخلف)

(10 points)

Question4:

(a) Implement a full adder circuit with a decoder and two OR gates.

(b) Analysis the following combinational circuit:



(10 points)

Question5:

Simplify the following Boolean function:

$$F(A, B, C, D) = \Sigma m(0, 1, 2, 5, 8, 9, 10) + \Sigma d(12)$$

into:

(a) Sum-of-products form

(b) Products-of-sum form

(10 points)

Question6:

(a) Given the two binary numbers $X = 110101$ and $Y = 011110$,

perform the subtraction $(X-Y)$

(b) Implement the following Boolean expressions:

$$F(A, B, C) = ((A+BC)' + (AB')')'$$

أنتهت الأسئلة

مع تمنياتي بالتوفيق

Dr. Diana Tharwat Mosa

2018

التاريخ: / /

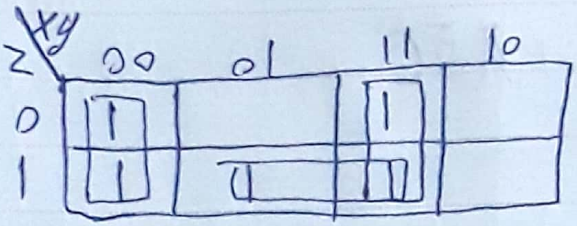
الموضوع

Question 1

(a) $F(X,Y,Z) = \Sigma(0,1,3,6,7)$

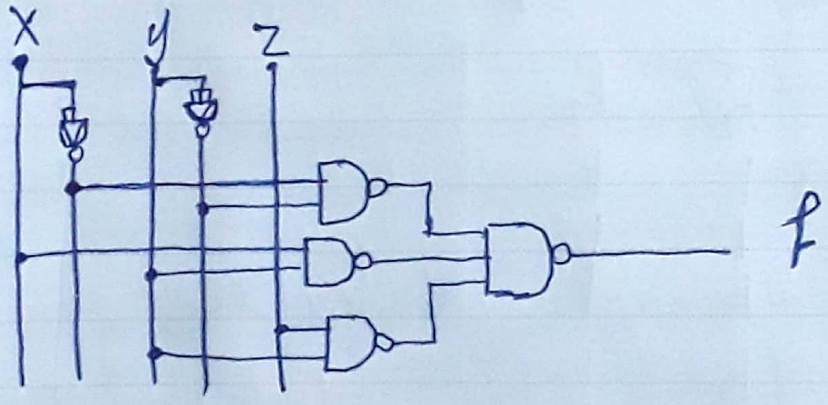
(b) $F(X,Y,Z) = \Pi(2,4,5)$

(c)



$F = \bar{x}\bar{y} + xy + zy$

(d) $F = \bar{x}\bar{y} + xy + zy$, $\bar{F} = (\bar{x}\bar{y})' \cdot (xy)' \cdot (zy)'$



SENA

Question 2

(a) $(b4CD)_{16} = (0110\ 0100\ 1100\ 1101)_2$

$(0110\ 0100\ 1100\ 1101)_2 = (b2315)_8$

(b)

K-map

C \ AB	00	01	11	10
0	1	1	1	1
1			1	

$F = \bar{C} + AB$

Algebraic

$\bar{A}\bar{C} + ABC + A\bar{C} = \bar{C}(\bar{A}+A) + ABC$

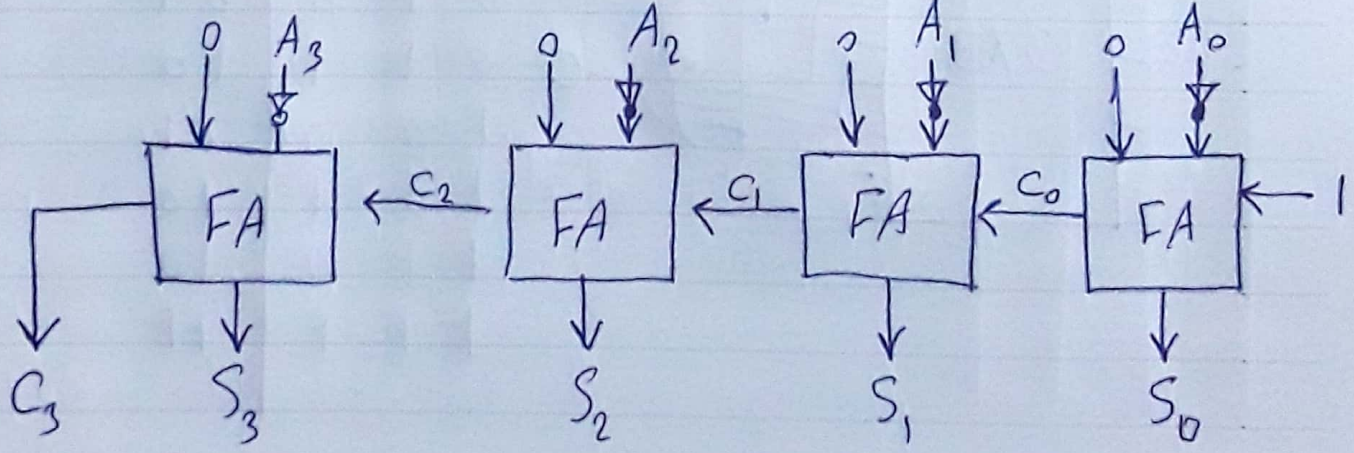
$= \bar{C} + ABC = (\bar{C}+A)\cdot(\bar{C}+B)\cdot(\bar{C}+C)$

$= (\bar{C}+A)\cdot(\bar{C}+B) = \bar{C} + \cancel{\bar{C}B} + \cancel{A\bar{C}} + AB$

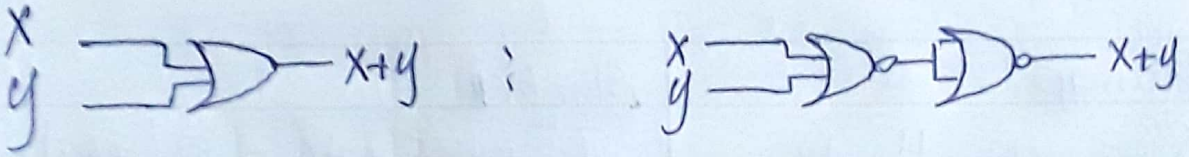
$= \bar{C} + AB$

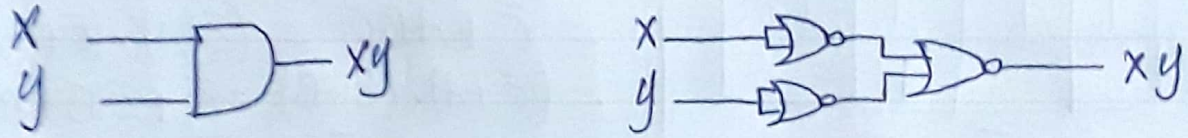
Question 3

(a) using Full adder A 2's $= \bar{A} + 1$.



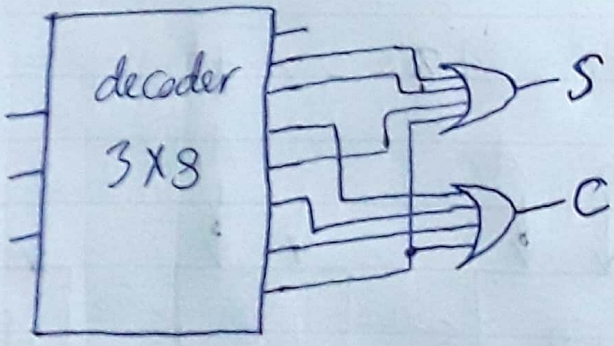
(b) That is because we can by combion nor gates get basic gates





Question 4

(a)



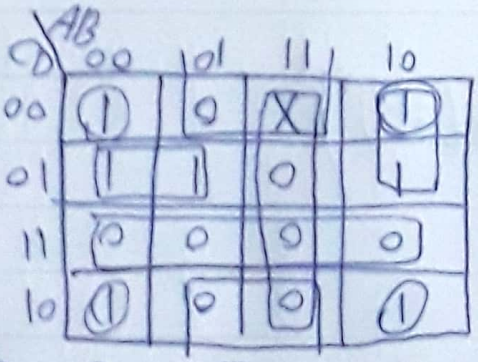
x	y	z	C	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

(b) التاريخ: / / الموضوع

X	y	Z	$X \oplus Z$	$(X \oplus Z)'$	$(X \oplus Z)' + y$
0	0	0	0	1	1
0	0	1	1	0	0
0	1	0	1	0	1
0	1	1	0	1	1
1	0	0	1	0	0
1	0	1	0	1	1
1	1	0	0	1	1
1	1	1	1	0	1

Question 5

(a)



(a) $F = \bar{D}\bar{B} + C\bar{D}\bar{A} + A\bar{B}\bar{C}$ (SOP)

(b) $\bar{F} = AB + CD + B\bar{D}$, $F = (AB + CD + B\bar{D})'$

$= (\bar{A} + \bar{B}) \cdot (\bar{C} + \bar{D}) \cdot (\bar{B} + D)$ (POS)

Question 6

(a) $X = 110101$, $y = 011110$

$X - y$, $110101 - 011110$

2's complement Y

100001 1's

$+1$

100010 2's

$110101 + 100010$

$1010111 - 1000000$

$+ 010111 \rightarrow$ ANS

(b) $F(A,B,C) = \left((A+BC)' + (A\bar{B})' \right)'$