

Name: _____

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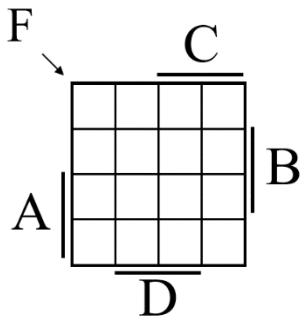
I+C Technology

First Exam, 1st Semester: 2016/2017

28.10.2016

1., Simplify the following Boolean expression using Boolean rules. Convert the simplified expression into the canonical form. ($A=2^3, B=2^2, C=2^1, D=2^0$)

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

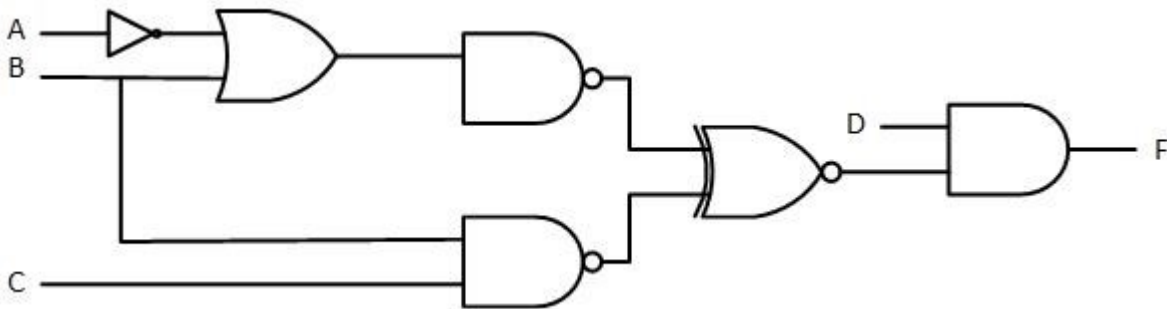


Solution

$$F = \sum^4 (\text{_____})$$

(6 pts)

2., Given is a logic circuit below. Write a possible combination of input values, when the output F is 1 and input A is 0. Write a combination of input values if you can change only one input and the output F alters to 0.



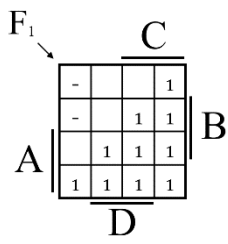
Solution

$$F = 1, \text{ if } A = 0, B = _, C = _, D = _$$

$$F = 0, _ \text{ input change}$$

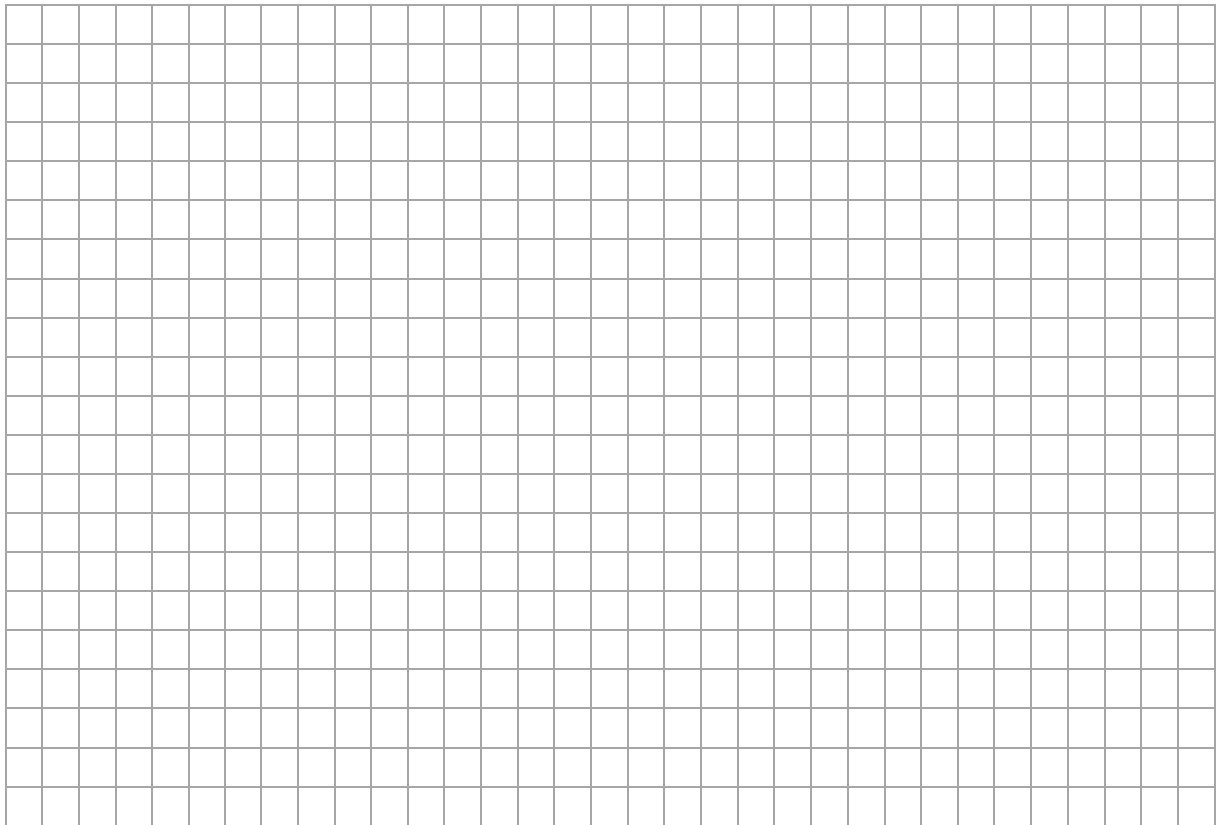
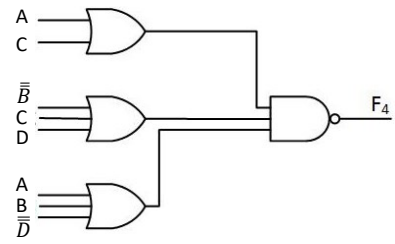
(5 pts)

3., What is the relation between these functions?



$$F_2 = \sum^4 (0,1,3,4,5,12)$$

$$F_3 = C(B + \bar{D}) + A(\bar{B} + D)$$

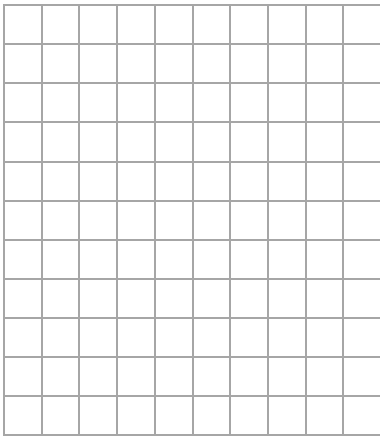
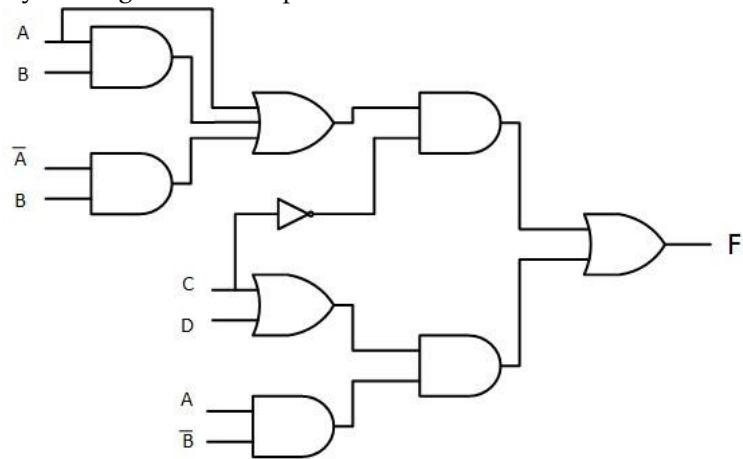


Solution

$$F_1 \text{ --- } F_2 \text{ --- } F_3 \text{ --- } F_4$$

(8 pts)

4., Write a Boolean expression for the following circuit (F), then simplify that expression as much as possible. Draw a logic gate circuit using only NAND gates with 2 inputs.



Solution

(7 pts)

5., Construct a circuit that has 4 inputs (A,B,C,D) and 3 outputs. A four-bit binary number ($A=2^3, B=2^2, C=2^1, D=2^0$), appears on the input to a combinational logic circuit. Output F_1 indicates whether the number is divisible by 2 without any remainder (see row 4 e.g.), output F_2 indicates if the number is divisible by 5 without remainder (see row 5 e.g.) and output F_3 indicates if the number is divisible by 2 and 5 too. Obtain the algebra form for F_1 and F_2 . Draw a circuit diagram for the minimized the F_3 functions. (0 is divisible by any number)

	A	B	C	D	F_1	F_2	F_3
0	0	0	0	0			
1	0	0	0	1			
2	0	0	1	0			
3	0	0	1	1			
4	0	1	0	0	1	0	0
5	0	1	0	1	0	1	0
	0	1	1	0			
	0	1	1	1			
	1	0	0	0			
	1	0	0	1			
	1	0	1	0			
	1	0	1	1			
	1	1	0	0			
	1	1	0	1			
	1	1	1	0			
	1	1	1	1			

Solution	
$F_1 =$	$F_2 =$
F_3	

(10 pts)