Modern Digital System Design

ECE 2372

First Test

Texas Tech University

ECE Department

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First Name: ……

Last Name: ……

R#: ……

Section#: ……

« 1 » A) Complete the following table such that all of the numbers in each row be equal:

Decimal	Binary	Hexadecimal	Octal
57			
	1110010		
		CF	
			77

B) Consider following Boolean Function: **F=ac + b(a+c)**

B1: find the SOP form of the function

B2: find the SOM form of the function

B3: find the POM form of the function

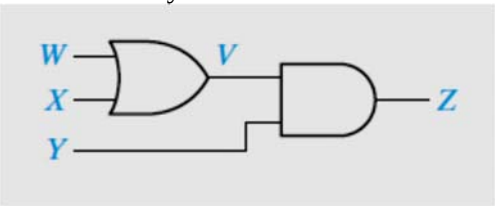
B4: find the POS form of the function

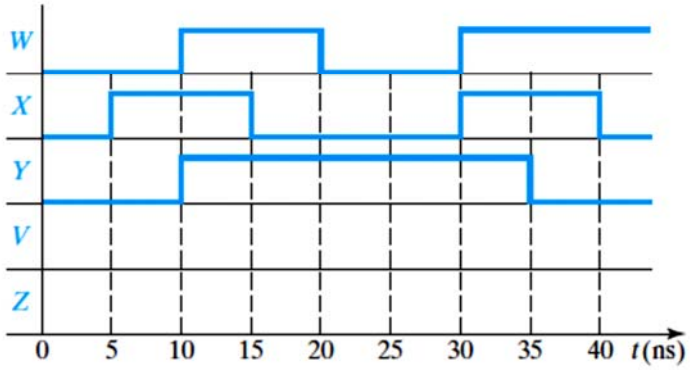
« 2 » Find a minimum sum of products and a minimum product of sums expression for each function:

(a) f (a, b, c, d) = $\sum_m(0, 2, 4, 5, 6, 9, 11, 15) + \sum_m(7, 8, 11)$

(b) f (w, x, y, z) = $\sum_m(0,1, 2, 6, 7, 9, 10, 15,16,18,20,21,27,30)+\sum_m(3, 4, 11, 12,19)$

« 3 » A) Draw the timing diagram of *V* and *Z* for the circuit. Assume that the logic gates are ideal and delay is zero:





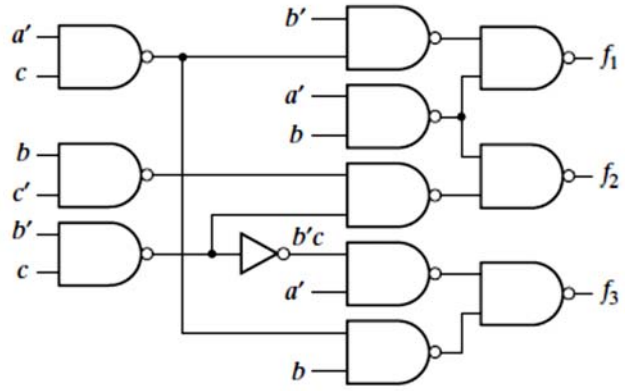
b) Draw a circuit that uses only one AND gate and one OR gate to realize each of the following functions:

(a) ABCF + ACEF + ACDF

(b) (V + W + Y + Z)(U + W + Y + Z)(W + X + Y + Z)

« 4 » a) Find the simplest form of the functions (f1, f2, f3) for following circuit.

b) Implement the “f2” function with only NOR gates.



« 5 » Find a minimum two level, circuit to realize following function.

$\boldsymbol{F} = \mathrm{f(a, b, c, d)} = \sum_{\boldsymbol{m}} (\mathbf{0}, \mathbf{1}, \mathbf{2}, \mathbf{8}, \mathbf{9}, \mathbf{10}, \mathbf{11}, \mathbf{15})$

a) AND-OR

b) NAND-NAND

c) OR-AND

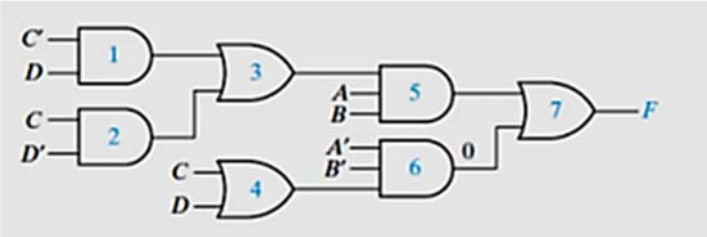
d) NOR-NOR

« 6 » Multiply out and simplify to obtain a sum of products::

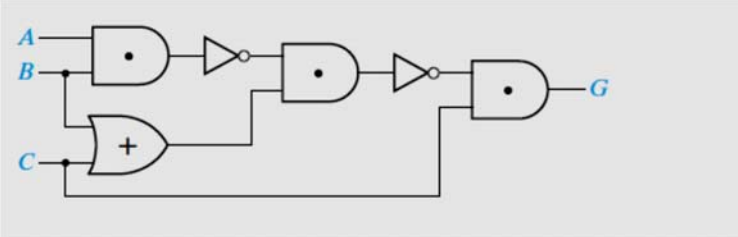
(a) (*A* + *B*)(*C* + *B*)(*D*'+ *B*)(*ACD*'+ *E*)
(b) (*A*'+ *B* + *C*')(*A*'+ *C*'+*D*)(*B*'+*D*')

« 7 » Find *output functions* and simplify:

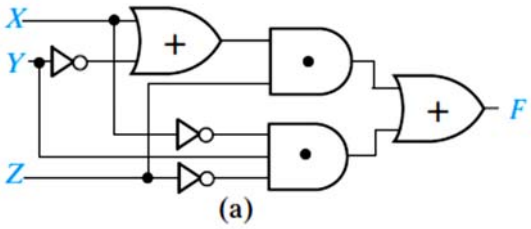
a) Then realize the simplified function with only NAND gate



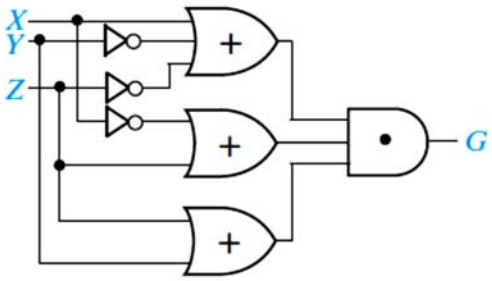
b) Then realize the simplified function with only NOR gate



« 8 » Show that the following two gate circuits realize the same function.



(a)



(b)

GOOD LUCK