CMPUT 329 - Computer Organization and Architecture II
Quiz # 4 — Fall 2003

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Name:

CMPUT 329 Honor Code

By turning in the quiz solution for grading, I certify that I have worked all the solutions on my own, that I have not copied or transcribed solutions from a classmate, someone outside the class, or from any other source. I also certify that I have not facilitated or allowed any of my classmates to copy my own solutions. I am aware that the violation of this honor code constitutes a breach of the trust granted me by the teaching staff, compromises my reputation, and subjects me to the penalties prescribed in Section 26.1 of the University of Alberta 2003/2004 Calendar.

Edmonton, September, 2003.

Question 1 (20 points): Given the following sentence and the boolean variables:

"I am unhappy because if there is a Summer festival in Edmonton when I am not working, it is either too hot or it is raining."

```
FESTIVAL := True if there is a Summer festival in Edmonton, false otherwise
WORKING  := True if I am working, false otherwise
HOT      := True if it is too hot in Edmonton, false otherwise
RAIN     := True if it is raining in Edmonton, false otherwise
UNHAPPY  := True if I am unhappy, false otherwise
HAPPY = UNHAPPY'
```

a. (25 points) Write the minimum sum of product form for the boolean expression that makes the boolean variable `UNHAPPY` true according to the sentence.

b. (25 points) Using only boolean algebra theorems and the DeMorgan's laws, write the minimized sum of product expression that makes the variable HAPPY true according to the expression that you wrote for (a).

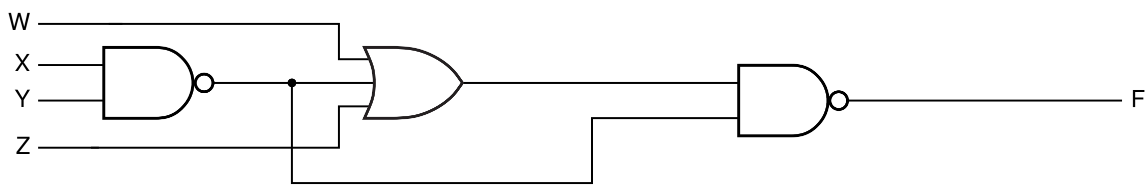

Figure 1: A combinatorial circuit that implements $F(V, W, X, Y, Z)$.

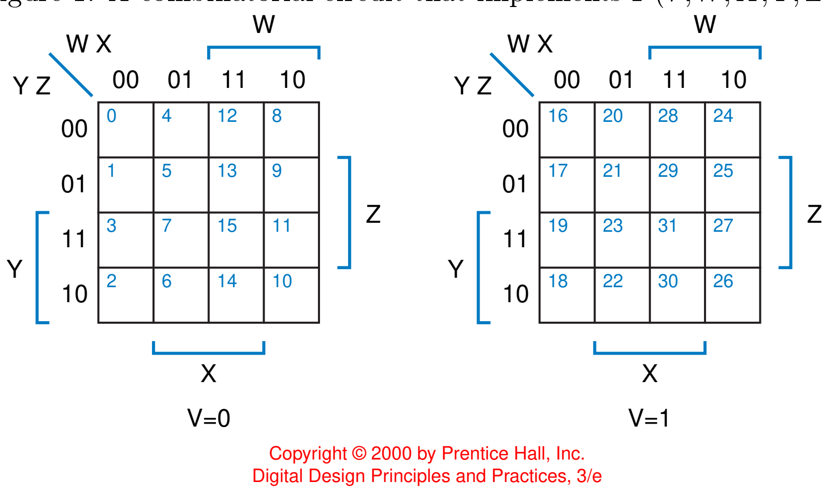

Figure 2: Karnaugh Map for $F(V, W, X, Y, Z)$

Question 2 (50 points): Assuming that function $F(V, W, X, Y, Z)$ is implemented by the circuit of Figure 1.

a. (10 points) Write the boolean expression that is implemented by the circuit of Figure 1. Do not simplify or transform, write exactly the expression as implemented by the circuit.

b. (15 points) Fill each cell of the Karnaugh Map of Figure 2 with the correct 0 or 1 value.

c. (25 points) Based on your Karnaugh Map, write a minimized sum-of-products expression for the complement of the function, $F'(V, W, X, Y, Z)$.