UNIVERSITY OF VIRGINIA ECE/CS 2330 DIGITAL LOGIC DESIGN STUDIO ASSIGNMENT 2

This assignment is to be completed without any aid from anyone other than the teaching staff for this class. You may use only the class text, other materials provided to you by the teaching staff for this class, and your own class notes to complete this assignment. You must not offer or provide unauthorized aid to others taking this class. Submission of any part of this assignment represents your affirmation that you have complied with these requirements.

OBJECTIVE

This studio assignment will give you the opportunity to practice translating words to logic functions and implementing them in Logisim. This assignment contains two different word problems that have appeared on previous tests.

PROBLEM DESCRIPTION 1

UVA students who want to enter the meeting place for the Terces society they show their ID card to the haughty security guard (HSG). The HSG uses a secret, complex set of criteria to permit admittance to the Terces society meeting. A young (less than 21) person can enter the meeting if the ID number is odd and they are not a SEAS student. Old students are not permitted unless they are SEAS students. An even ID number can gain admittance for a young SEAS student. A young student can enter if the ID number is odd. An odd ID number on a SEAS student's ID card gains admittance. An old even SEAS student gains admittance. A young even student always gains admittance. No one else can gain admittance.

High turnover among HSG's has created a problem – new HSG's are having trouble remembering all the conditions. Suggest the simplest set of criteria that produce the same result. (Define your variables carefully and prove that your result is equivalent).

PROBLEM DESCRIPTION 2

Chris wants to attend clown camp but finds the list of qualifications confusing. Chris is a good tumbler and an excellent juggler but cannot be quiet enough to be considered a good mime or a

good charade player. The clown camp will accept anyone who is a complete beginner, that is, someone who cannot juggle, cannot mime and cannot tumble. It will also accept an applicant who can do all three: juggle, mime and tumble. A juggler who can neither mime nor tumble is acceptable. A tumbler who can neither mime nor juggle is acceptable. A tumbler who can mime or can juggle is acceptable. Derive a minimal logic function that expresses the qualifications for clown camp.

PRE-WORK

Before reporting for your scheduled studio meeting, you are required to complete the following tasks:

- 1. Define appropriate binary variables for the inputs and outputs. Make sure your variables are all independent.
- 2. Use Boolean algebra to reduce the logic equations so that your implementation will be easier. Do not use Logisim to perform this step. It's important for you to learn how to manipulate the functions.
- 3. Using *Logisim*, draw the logic diagram for your circuit and verify that it is correct. To verify correctness, try every possible input combination and check to see that the outputs are correct for each.
- 4. Make sure that all the inputs and outputs are clearly labeled so that HSG's and clown camp admissions folks can understand the interface. Remember they needed help with determining logic functions so you have to make your interface understandable to them.

In Studio

Bring your completed *Logisim* file and your documented design procedure to the studio to be

reviewed by your studio instructor. Be prepared to answer questions about your design and make suggested changes to demonstrate understanding.

The studio assignment may be completed before you come to the session. It will be graded on the spot. No report is needed.

Grading Criteria

- 2 points for definition of variables and expression of logic functions
- 2 points for correct minimal form of logic expressions
- 1 point for well-defined & labeled inputs and outputs
- 2 points for correct and beautiful circuits
- 2 points for demonstration and explanation to TA and for answering questions
- 1 point for professionalism