Points missed: _____ Student's Name: _____

Total score: _____ /100 points

East Tennessee State University
Department of Computer and Information Sciences
CSCI 2150 – Computer Organization
TEST 2 for Fall Semester, 2000

Instructor: David Tarnoff

Read this before starting!

- The total possible score for this test is 100 points.
- This test is closed book and closed notes
- You may use a calculator
- **All** answers **must** be placed in blanks provided. Failure to do so will result in no credit for answer.
- **1 point** will be deducted per answer for missing or incorrect units when required. **No** assumptions will be made for hexadecimal versus decimal, so you should always include the base in your answer.
- If you perform work on the back of a page in this test, indicate that you have done so in case the need arises for partial credit to be determined.

"Fine print"

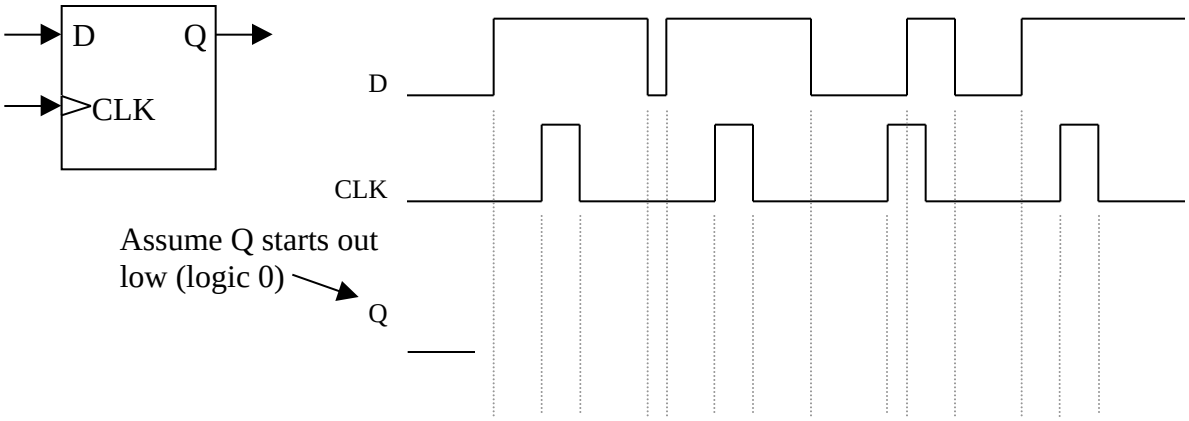
Academic Misconduct:

ETSU Policy No. 3.13, October 1, 1979:

"All students in attendance at East Tennessee State University are expected to be honorable."

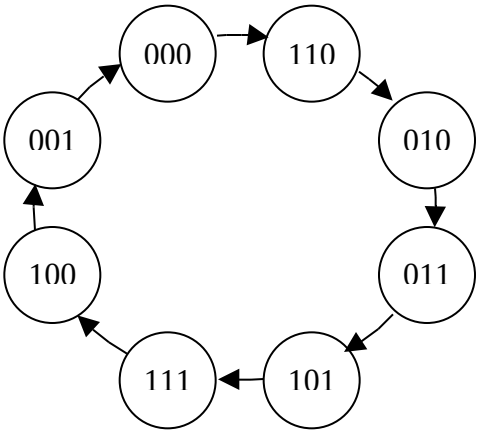
"Academic misconduct will be subject to disciplinary action. Any act of dishonesty in academic work constitutes academic misconduct. This includes plagiarism, the changing or falsifying of any academic documents or materials, cheating, and the giving or receiving of unauthorized aid in tests, examinations, or other assigned school work. Penalties for academic misconduct will vary with the seriousness of the offense and may include, but are not limited to: a grade of "F" on the work in question, a grade of "F" for the course, reprimand, probation, suspension, and expulsion. For a second academic offense, the penalty is permanent expulsion."

1.) Show the D flip-flop output waveform Q for the inputs D and CLK indicated in the figure below. (Assume the flip-flop captures on the rising edge.) (8 points)

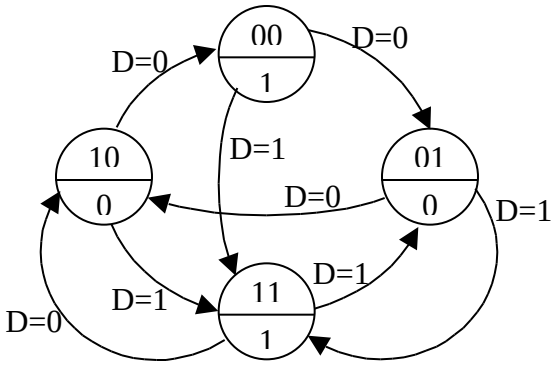


2.) How many D flip-flops will you need to represent a state diagram with 9 states? (i.e., what is the minimum number of bits you will need to number 9 states?) (5 points)

3.) Create the next state truth table from the state diagram below. Make sure you label the bits of your states using the state numbers from the diagram. (10 points)



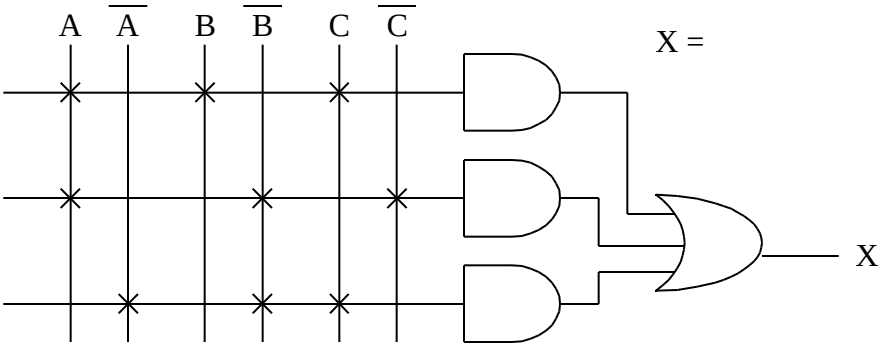
4.) The top half of each node in the state diagram to the right represents the state number and the bottom half shows the output for that state. If the current state is 01 and the input D equals 0, what is the next state and the new output value after the state change? (5 points)



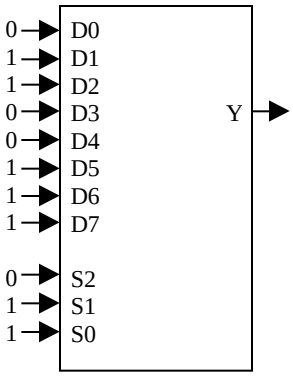
5.) The two Boolean expressions below represent the next state (S_0' and S_1') based on the current state (S_0 and S_1). Draw the logic circuit for the state machine. (10 points):

$$S_0' = S_0\overline{S_1} + \overline{S_0}S_1 \qquad S_1' = \overline{S_0}\overline{S_1} + S_0S_1$$

6.) Write the Boolean expression for X represented by the PLA diagram below. (7 points):



7.) What is the value at the output Y of the 1-of-8 multiplexer shown to the right? (5 points)



8.) Draw the decoding logic for an active-LOW output for the input $A_0 = 0$, $A_1 = 1$, $A_2 = 1$, $A_3 = 0$, and $A_4 = 1$. (5 points)

9.) A tristate output buffer has an additional state other than logic 1 and logic 0. What does that state do? (6 points)

10.) Circle all the memory types below that are non-volatile. (4 points)

a.) Battery-backed SRAM	b.) Flash RAM	c.) Custom-masked ROM
d.) EEPROM	e.) OTPROM	f.) EPROM

11.) Circle all the memory types below that require a special programmer for programming. (4 points)

a.) Battery-backed SRAM	b.) Flash RAM	c.) DRAM
d.) EEPROM	e.) OTPROM	f.) EPROM

12.) Circle all the memory types below that can be written to multiple times. (4 points)

a.) Battery-backed SRAM	b.) Flash RAM	c.) Custom-masked ROM
d.) EEPROM	e.) OTPROM	f.) EPROM

13.) How many address lines does a processor with a 128K memory space have? (5 points)

14.) Can a 16K memory chip have a starting address of 0x3C000? (6 points)

15.) What is the high address **IN HEX** for an 8K ROM with a low address of 0x4000? (6 points)

16.) Design the chip select for a 32K RAM placed in a 1MEG memory space with a low address of 0x78000. (10 points)