Final Exam – Finite State Machines

1. A state machine is used for all of the following purposes except _____.
   a. to describe the behavior of a real world system
   b. to model a random event
   c. to describe the relationship between the inputs and outputs of a system
   d. to ensure the predictability of a control system

2. A state machine is composed of all of the following except _____.
   a. a set of states
   b. a set of possible input events
   c. a function that maps current state and input to next state
   d. an instruction set

3. A hardware implementation of a state machine containing 19 states will require _____ flip-flops.
   a. 3
   b. 4
   c. 5
   d. 6

4. Two state machine architectures, Mealy and Moore machines, are differentiated by _____.
   a. their output dependencies
   b. the number of inputs
   c. the number of states
   d. their initial state

5. The architecture whose output depends both on input and current state is _____.
   a. Mealy machine
   b. Moore machine
   c. both Mealy and Moore machines
   d. neither Mealy nor Moore machines

6. A Mealy machine often results in fewer states than a Moore machine.
   a. True
   b. False

1 / 0

0 / 0

1 / 0

S$_0$ S$_1$

0 / 0

0 / 1   **0 / 0**

1 / 0

S$_3$ S$_2$

1 / 0
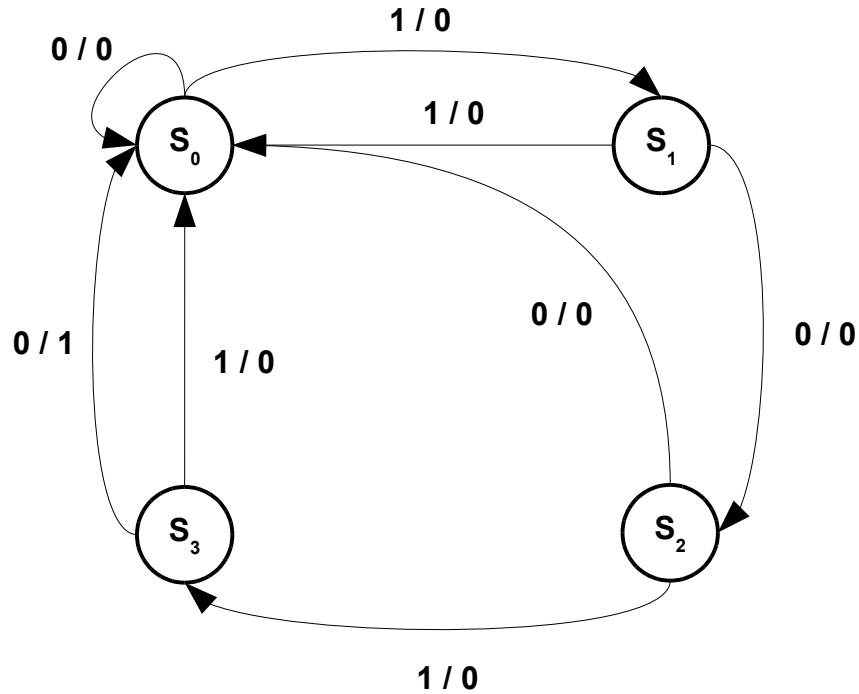
7. For the state machine described by the above state diagram, if the current state is S$_2$, an input of 1 would generate a next state of _____.
    a. S$_0$
    b. S$_1$
    c. S$_2$
    d. S$_3$

8. For the state machine described by the above state diagram, if the current state is S$_3$, an input of 1 would generate a next state _____ and output of _____.
    a. next state S$_0$, output 1
    b. next state S$_2$, output 0
    c. next state S$_0$, output 0
    d. next state S$_1$, output 1

9. The state machine described is a _____.
    a. Moore machine
    b. Mealy machine
    c. a Mealy and Moore machine hybrid
    d. neither a Mealy nor Moore machine

10. A state machine may be implemented using _____.
    a. flip-flops and combinational logic
    b. a microprocessor programmed with a software implementation of a state machine
    c. an FPGA loaded with a Verilog implementation of a state machine
    d. all of the above

11. A disadvantage of a hardware implementation of a state machine using flip-flops and discrete logic is _____.
    a. that the implementation requires significant circuit board space
    b. that the design is difficult to modify
    c. the design is difficult to debug
    d. all of the above

12. A pure hardware implementation of a state machine is often slower than a software implementation.
    a. True
    b. False

13. The main advantage of a software implementation of a state machine over a hardware implementation is _____.
    a. the software implementation is always faster than a hardware implementation
    b. the software implementation requires fewer states than a hardware implementation
    c. the software implementation is more versatile, i.e., easier to modify than a hardware implementation
    d. all of the above

14. The component of a state machine, regardless of implementation, that stores the current state of the system is _____.
    a. the state diagram
    b. memory
    c. combinational logic
    d. a transition

15. A state machine would best be used to describe all of the following except _____.
    a. a household appliance controller
    b. a communications protocol that parses symbols as they are received
    c. a fractal geometry algorithm
    d. an electronic garage door opener