

Indian Institute of Technology, Delhi
EEL 201: Digital Electronic Circuits
Tutorial 8, 20th October 2009

1. Consider the Mealy machine shown in Fig. 1. Convert it into a Moore type machine, assuming that the initial state is state 'A'.

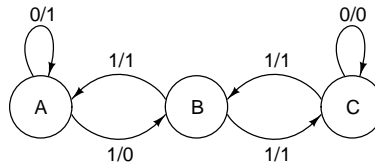


Figure 1:

2. Assign codes to each of the states of the state machine shown in Fig. 1. Now, write a Verilog module that behaves like the above state machine.
3. Write a Verilog module that behaves like a four bit Johnson counter. (The states of a Johnson counter are in the sequence: 0000, 0001, 0011, 0111, 1111, 1110, 1100, 1000, 0000, ...)
4. Draw a state machine for the following Verilog code:

```

module state_machine (
  output y_out,
  input x_in, clock, reset
);
  reg [1:0] current_state, next_state;
  parameter S0=2b'00, S1=2b'01, S2=2b'10, S3=2b'11;

  always @(posedge clk, negedge reset)
  if (reset == 0) current_state <= S0;
  else current_state <= next_state;

  always @(x_in, current_state)
  case(current_state)
  S0: if(x_in) next_state <= S1; else next_state <= S0;
  S1: if(x_in) next_state <= S2; else next_state <= S0;
  S2: if(x_in) next_state <= S3; else next_state <= S0;
  S3: if(x_in) next_state <= S3; else next_state <= S0;
  default: next_state <= S0;
  endcase
endmodule
  
```

```
endcase

always @(current_state)
case(current_state)
S0: y_out <= 0;
S1: y_out <= 0;
S2: y_out <= 0;
S3: y_out <= 1;
endcase
endmodule
```

What kind of machine is the above? Mealy or Moore?

5. Construct a block diagram and an ASM chart for a digital system that counts the number of people in a room. The one door through which people enter the room has a photocell that changes a signal x from 1 to 0 when the light is interrupted. They leave the room from a second door with a similar photocell that changes a signal y from 1 to 0 when the light is interrupted. The datapath circuit consists of an up-down counter with a display that shows how many people are in the room.