Quiz 4
(April 7th @ 5:30 pm)

PROBLEM 1 (30 pts)
- Draw the state diagram (in ASM form) of the FSM whose VHDL description is listed below:

```vhdl
library ieee;
use ieee.std_logic_1164.all;

entity circ is
  port (clk, resetn: in std_logic;
        a, b, c: in std_logic;
        x, w, z: out std_logic);
end circ;

architecture behavioral of circ is
  type state is (S1, S2, S3);
signal y: state;
begin
  Transitions: process (resetn, clk, a, b, c)
  begin
    if resetn = '0' then
      y <= S1;
    elsif (clk'event and clk = '1') then
      case y is
        when S1 =>
          if b = '1' then y <= S2; else y <= S3; end if;
        when S2 =>
          if a = '1' then y <= S3; else y <= S1; end if;
        when S3 =>
          if c = '1' then y <= S2; else y <= S1; end if;
      end case;
    end if;
  end process;
  Outputs: process (y, a, b, c)
  begin
    x <= '0'; w <= '0'; z <= '0';
    case y is
      when S1 =>
        when S2 =>
          x <= '1';
          if a = '0' then w <= '1'; end if;
      when S3 =>
        z <= '1';
    end case;
  end process;
end behavioral;
```

PROBLEM 2 (40 pts)
- Complete the timing diagram of the following FSM (represented in ASM form):

PROBLEM 3 (30 pts)
- Sequence detector (with overlap): Draw the state diagram (any representation) of a circuit that detects the following sequence: 10001. The detector must assert an output \( z = 1 \) when the sequence is detected.