Quiz 4

(April 7th @ 5:30 pm)

PROBLEM 1 (30 PTS)

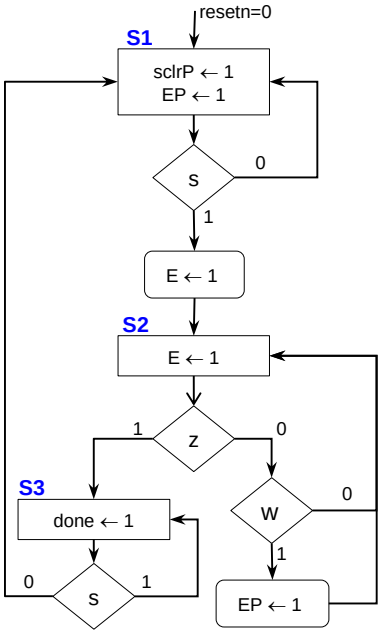
- Draw the state diagram (in ASM form) of the FSM whose VHDL description is listed below::

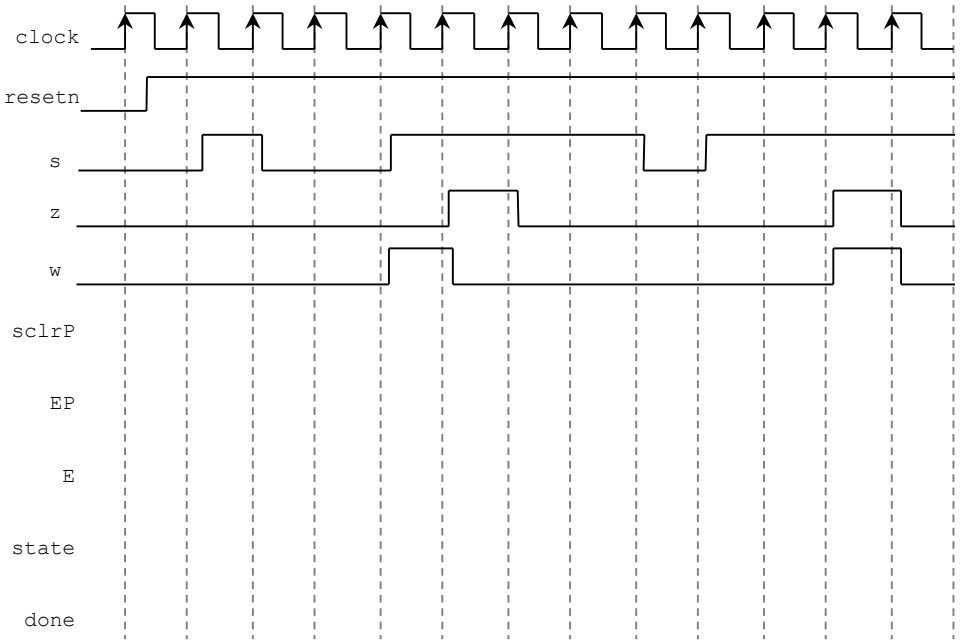
```
library ieee;
use ieee.std_logic_1164.all;

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.