

Quiz 4

(November 22nd @ 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, rstn: in std_logic;
          a, b: 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 (rstn, clk, a, b)
    begin
        if rstn = '0' then y <= S1;
        elsif (clk'event and clk = '1') then
            case y is
                when S1 =>
                    if a = '1' then y <= S2;
                    else if b = '1' then y <= S3; else y <= S1; end if;
                    end if;

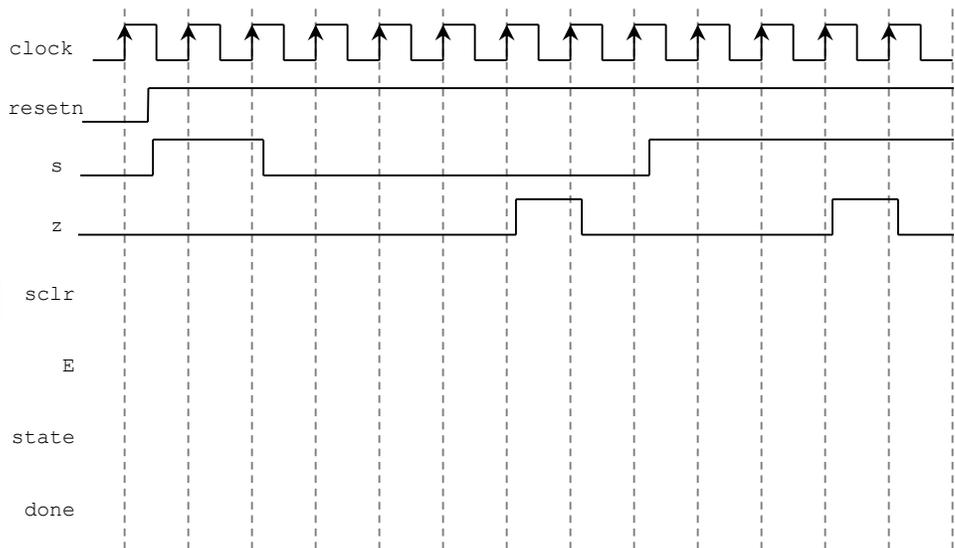
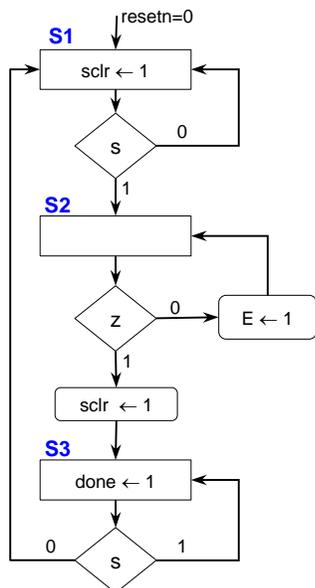
                when S2 =>
                    if a = '1' then y <= S2; else y <= S1; end if;

                when S3 =>
                    if b = '1' then y <= S3; else y <= S1; end if;
            end case;
        end if;
    end process;

    Outputs: process (y,a)
    begin
        x <= '0'; w <= '0'; z <= '0';
        case y is
            when S1 => if a = '1' then z <= '1'; end if;
            when S2 => x <= '1';
            when S3 => w <= '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 (in ASM mode) of a circuit that detects the following sequence: 0110. The detector must assert an output $z = 1$ when the sequence is detected.