

Solutions - Quiz 4

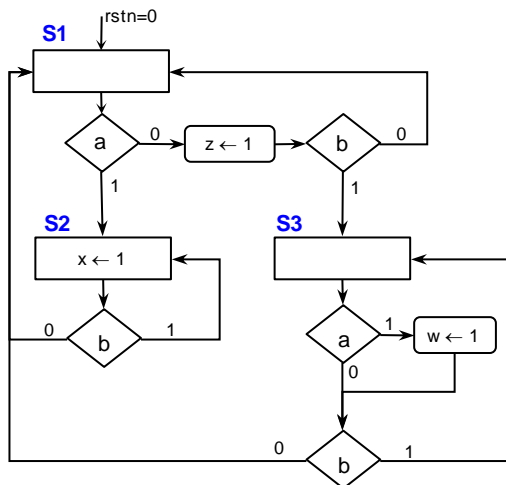
(April 2nd @ 5:30 pm)

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;
```

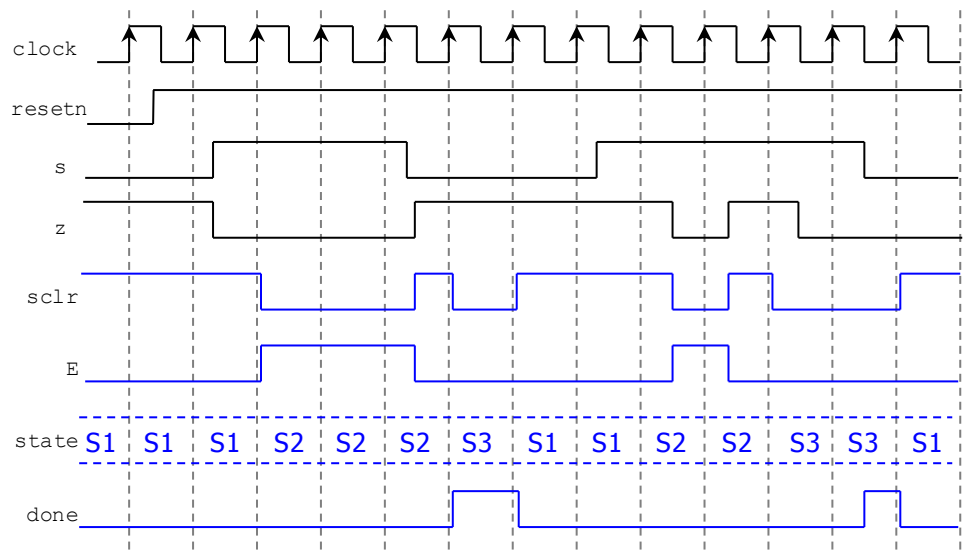
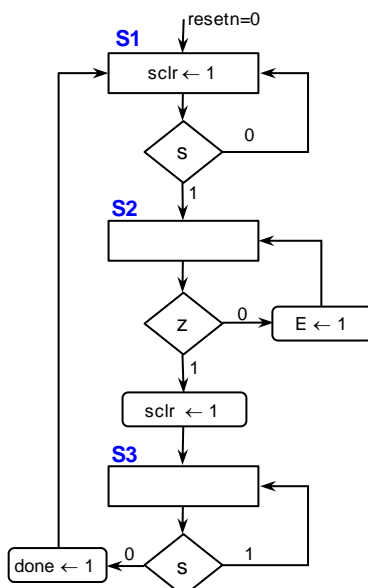


```
architecture behavioral of circ is
type state is (S1, S2, S3);
signal y: state;
begin
Transitions: process (rstn, clk, a, b)
begin
if rstn = '0' then y <= S1;
elsif (clk'event and clk = '1') then
case y is
when S1 =>
if a = '1' then y <= S2;
else if b = '1' then y <= S3; else y <= S1; end if;
end if;
when S2 =>
if b = '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 = '0' then z <= '1'; end if;
when S2 => x <= '1';
when S3 => if a = '1' then w <= '1'; end if;
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: Draw the state diagram (any representation) of an FSM with input x and output z . The detector asserts $z = 1$ when the sequence 1011 is detected. Right after the sequence is detected, the circuit looks for a new sequence.

