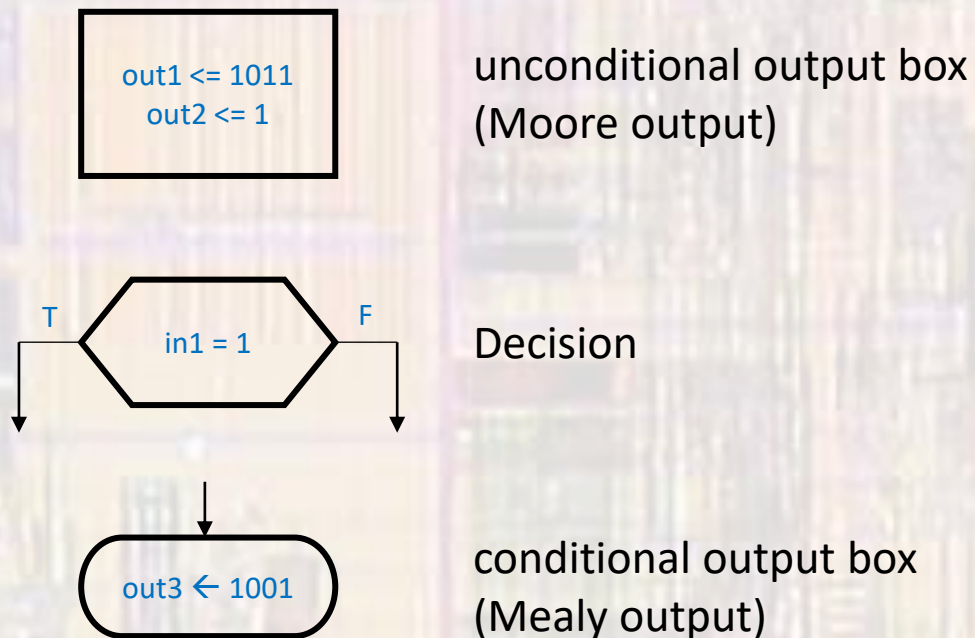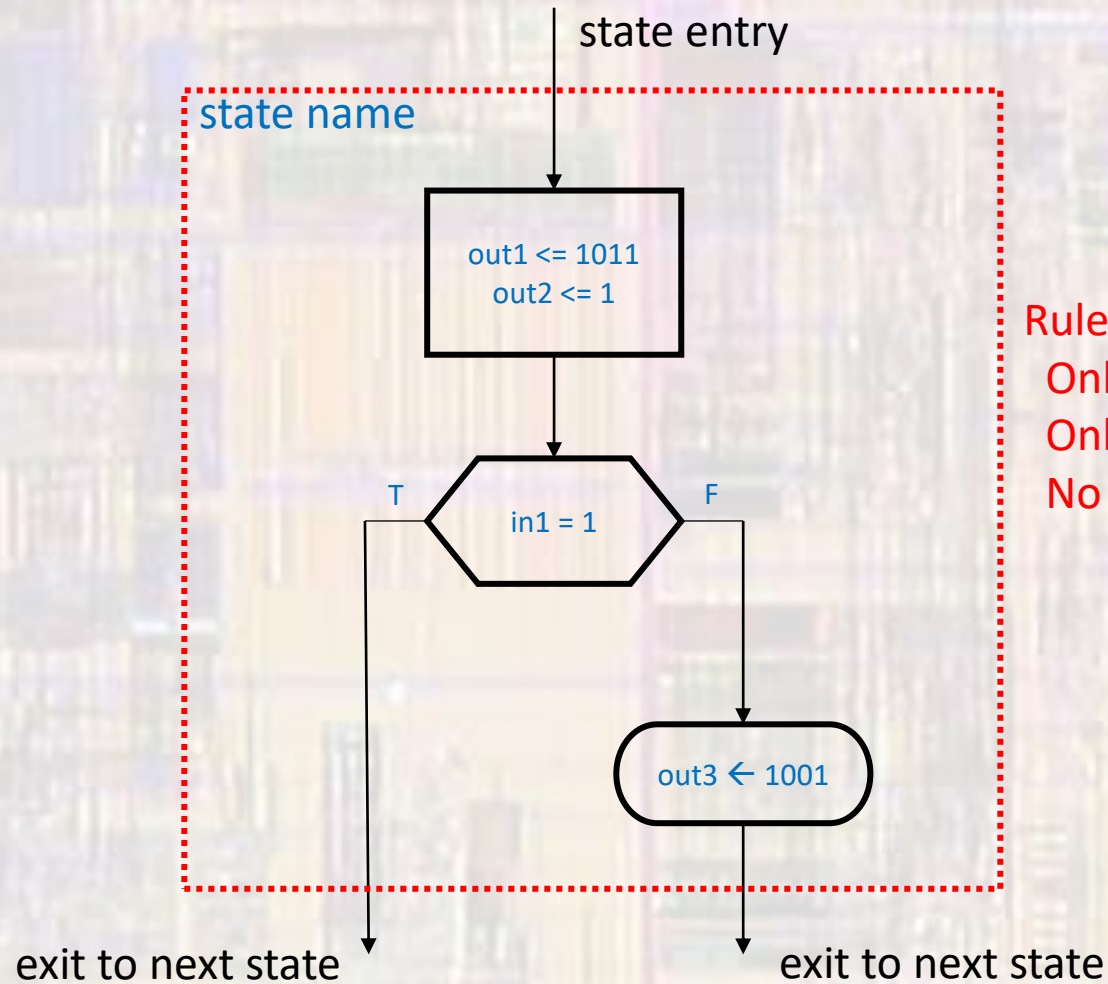# ASM

Last updated 1/28/21

ASM

- Algorithmic State Machine Chart (ASM)
  - State based representation
    - Alternative representation to a State Diagram
    - Used for Data Path representations

out1 <= 1011
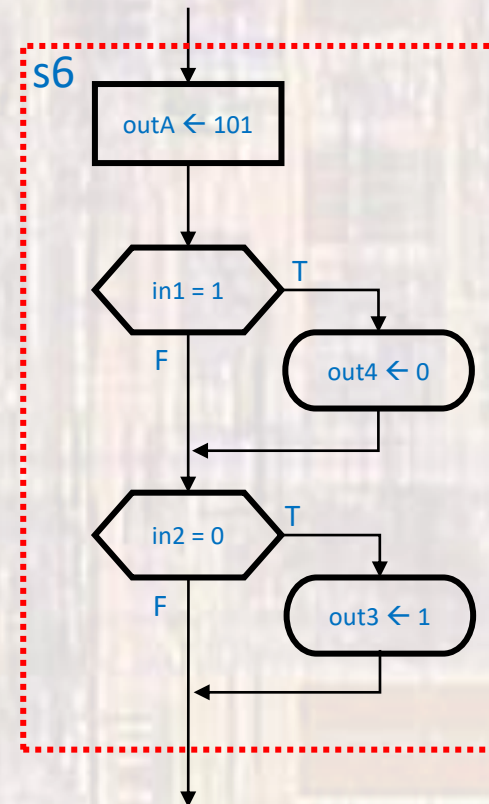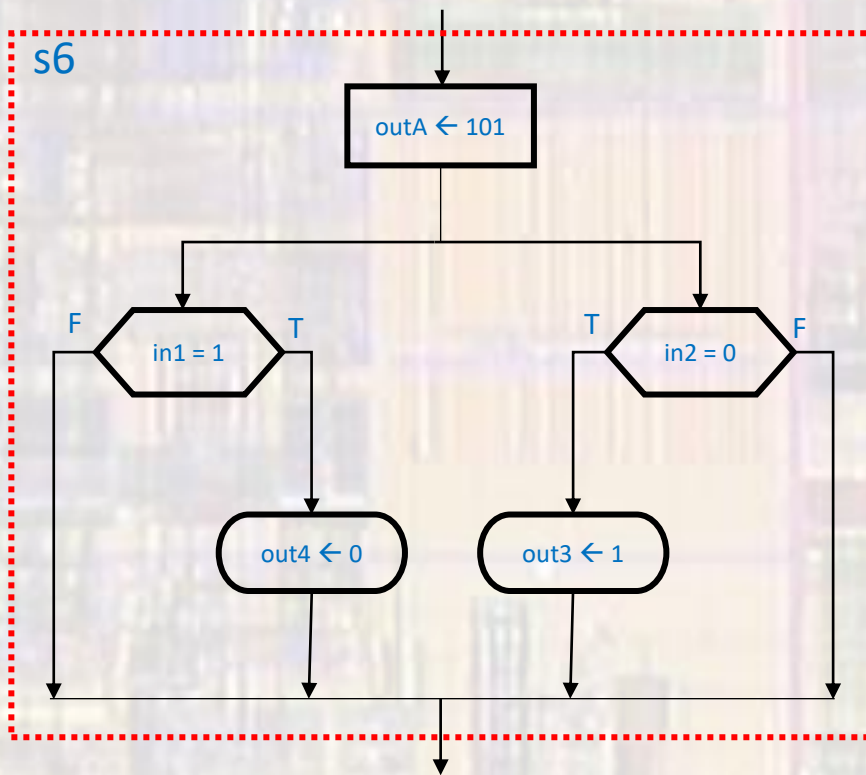out2 <= 1

unconditional output box
(Moore output)

T   in1 = 1   F

Decision

out3 ← 1001

conditional output box
(Mealy output)

ASM

- ASM Example

state entry

state name

out1 <= 1011
out2 <= 1

T   in1 = 1   F

out3 ← 1001

Rules:
  Only one input path
  Only one valid output path
  No internal feedback

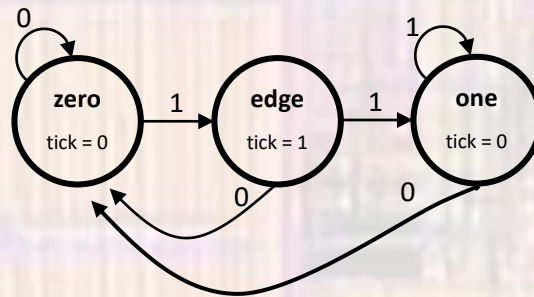exit to next state   exit to next state
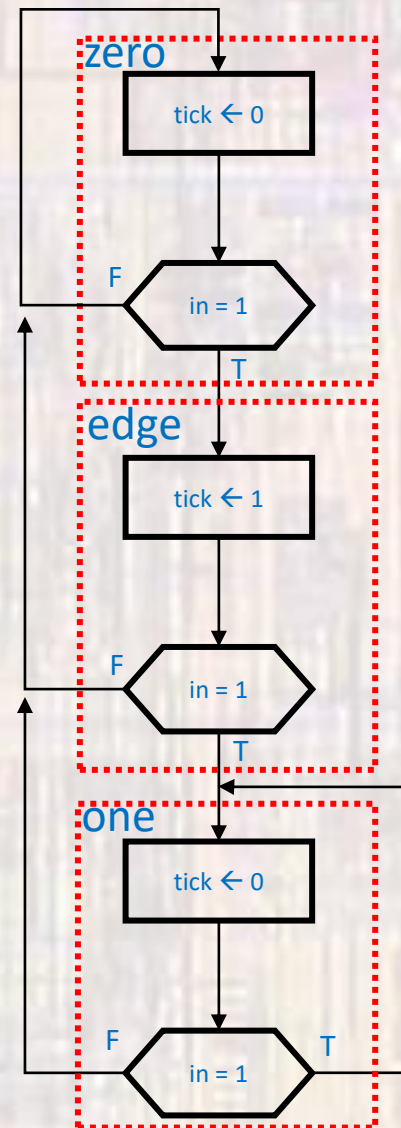
ASM

- ASM Example
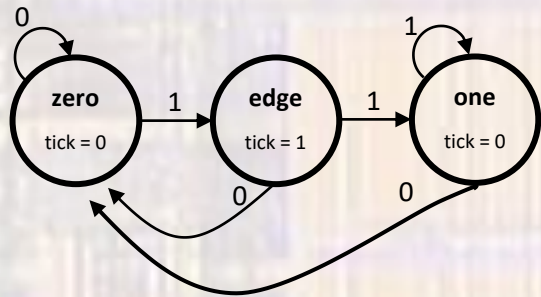
ASM

- Edge Detector

  - Rising edge
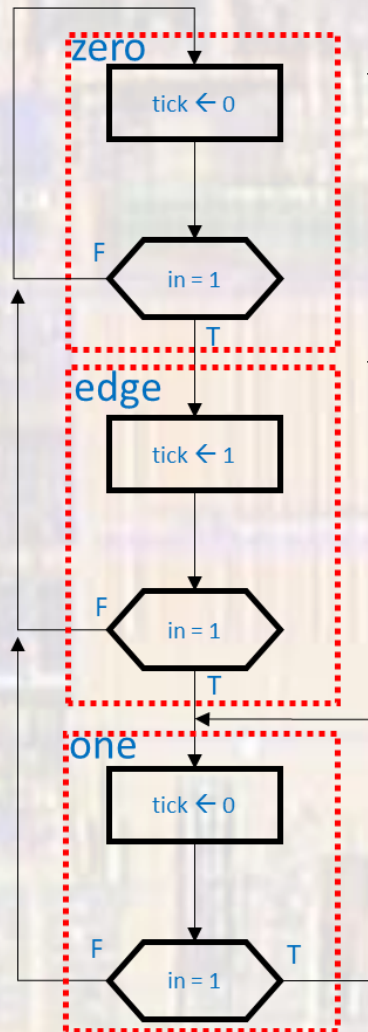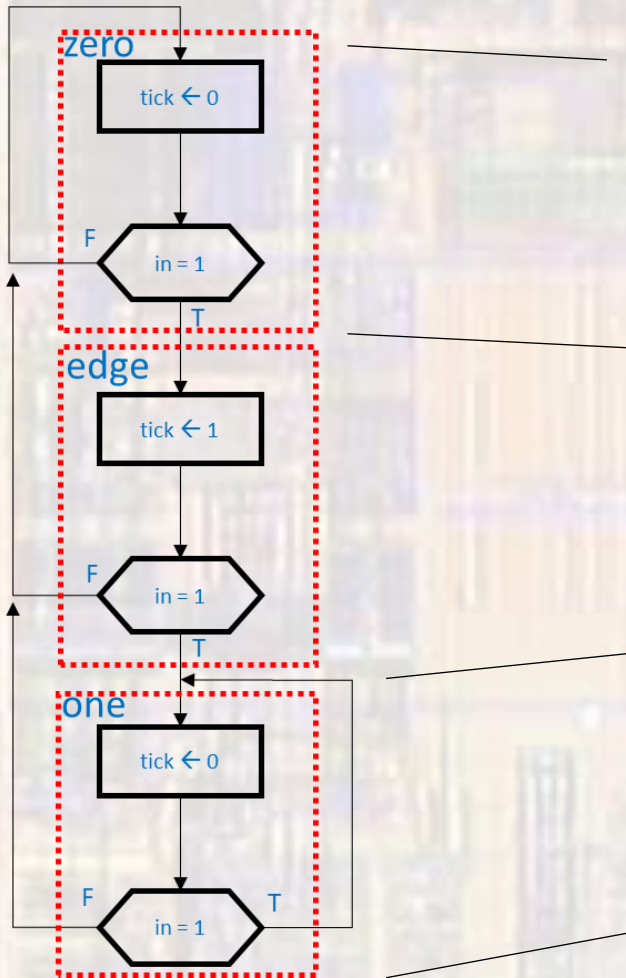
ASM

- Edge Detector

ASM

- Edge Detector


```
process(all)
begin
    case state is
        when zero =>
            tick <= '0';
            if in= '1' then
                state_next <= edge;
            else
                state_next <= zero;
            end if;
        when edge =>
            tick <= '1';
            if in= '1' then
                state_next <= one;
            else
                state_next <= zero;
            end if;
        when one =>
            tick <= '0';
            if in= '1' then
                state_next <= one;
            else
                state_next <= zero;
            end if;
    end case;
```

ASM

- Edge Detector


```
-- Next state logic
process(all)
  begin
    case state is
      when zero =>
        if in= '1' then
          state_next <= edge;
        else
          state_next <= zero;
        end if;
      when edge =>
        if in= '1' then
          state_next <= one;
        else
          state_next <= zero;
        end if;
      when one =>
        if in= '1' then
          state_next <= one;
        else
          state_next <= zero;
        end if;
    end case;
```

```
-- Output logic

process(all)
  begin
    case state is
      when zero =>
        tick <= '0';
      when edge =>
        tick <= '1';
      when one =>
        tick <= '0';
    end case;
```

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© tj