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**CPE 129 HW 21D**

Entity counter is

Port( X : in std\_logic\_vector(1 downto 0);

Reset\_L, CLK : in std\_logic;

Cumulative\_Sum : out std\_logic\_vector(1 downto 0);

Carry\_out : out std\_logic);

End counter;

Architecture behavioral is

Type State\_type is (00, 01, 10, 11);

Signal PS, NS : State\_type := 00;

Begin

Synch : process(CLK, Reset\_L, NS) is

Begin

If(Reset\_L = ‘1’) then PS <= 00;

Elsif(rising\_edge(CLK)) then PS <= NS;

End if;

End process synch;

Steps : process(X, PS) is

Begin

Case PS is

When 00 =>

If(X = “00”) then NS <= 00; Carry\_out <= ‘0’; Cumulative\_Sum <= “00”;

Elsif(X = “01”) then NS <= 01; Carry\_out <= ‘0’; Cumulative\_Sum <= “01”;

Elsif(X = “10”) then NS <= 10; Carry\_out <= ‘0’; Cumulative\_Sum <= “10”;

Else NS <= 11; Carry\_out <= ‘0’; Cumulative\_Sum <= “11”;

End if;

When 01 =>

If(X = “00”) then NS <= 01; Carry\_out <= ‘0’; Cumulative\_Sum <= “01”;

Elsif(X = “01”) then NS <= 10; Carry\_out <= ‘0’; Cumulative\_Sum <= “10”;

Elsif(X = “10”) then NS <= 11; Carry\_out <= ‘0’; Cumulative\_Sum <= “11”;

Else NS <= 00; Carry\_out <= ‘1’; Cumulative\_Sum <= “00”;

End if;

When 10 =>

If(X = “00”) then NS <= 10; Carry\_out <= ‘0’; Cumulative\_Sum <= “10”;

Elsif(X = “01”) then NS <= 11; Carry\_out <= ‘0’; Cumulative\_Sum <= “11”;

Elsif(X = “10”) then NS <= 00; Carry\_out <= ‘1’; Cumulative\_Sum <= “00”;

Else NS <= 01; Carry\_out <= ‘1’; Cumulative\_Sum <= “01”;

End if;

When 11 =>

If(X = “00”) then NS <= 11; Carry\_out <= ‘0’; Cumulative\_Sum <= “11”;

Elsif(X = “01”) then NS <= 00; Carry\_out <= ‘1’; Cumulative\_Sum <= “00”;

Elsif(X = “10”) then NS <= 01; Carry\_out <= ‘1’; Cumulative\_Sum <= “01”;

Else NS <= 10; Carry\_out <= ‘1’; Cumulative\_Sum <= “10”;

End if;

End process steps;

End behavioral;