Name: Id#

COE 202, Term 141

Digital Logic Design

Quiz# 6

 Date: Thursday, Dec. 25

**Q1** The sequential circuit shown below has a single output Z, an input *x* together with a Reset input to initialize the circuit. Note that the used D-FFs have direct/asynchronous Clear and Set inputs (shown in the figure as CLR and SET).



1. Is the circuit type Mealy or Moore? Why? ( 2 point)

Mealy since Z depends on the input *x*.

1. Derive expressions for the D0 and D1 flip flop inputs and the external output Z. (3 points)

$$D\_{0}=y\_{1}y\_{0}+\overbar{x} \overbar{y\_{0}}$$

$$D\_{1}=y\_{0}⊕x$$

$$Z=y\_{1}+D\_{1}$$

1. Derive the state transition table of the circuit. (4 points)

|  |  |  |
| --- | --- | --- |
| **PS** | **NS (y1+ y0+)** | **Z** |
| (y1 y0) | *x* = 0  *x* = 1 | *x* = 0  *x* = 1 |
|  0 0 |  0 1 1 0 |  1 0 |
|  0 1 |  1 0 0 0 |  0 0 |
|  1 1 |  1 1 0 1 |  1 1 |
|  1 0 |  0 1 1 0 |  1 1 |

1. What is the circuit initial state? (1 points)

$$y\_{1}y\_{0}=10$$

**Q2**  It is required to design a synchronous sequential circuit that receives a serial inputs **x** and produces a serial output **z** that computes the equation **z=x-2**. Draw the state diagram of this circuit assuming a **Mealy** model. Assume the existence of an asynchronous reset input to reset the machine to a reset state. Two samples of input/output data are given below.

(**NOTE**: You are *only* required to draw the state diagram **Nothing MORE**) (6 points)

t = 0

time

Examples:

|  |  |  |
| --- | --- | --- |
| Input | ***x*** |  0 1 0 1 |
| Output | ***z*** |  0 0 0 1  |

time

t = 0

Examples:

|  |  |  |
| --- | --- | --- |
| Input | ***x*** |  1 1 1 0 |
| Output | ***z*** |  1 0 1 0  |