The American University in Cairo
Computer Science and Engineering Department

Computer Architecture Lab –Quiz - Spring2022
Duration: 120 minutes

Name:	ID:

You are asked to design vending machine that accepts 5 cent, and 10 cent coins and sells pencils that cost 15 cents. The machine should be able to return extra money.

```
//Assumption for coins inputs combinations are
// user will enter 3*5 cent     (no money remaining)
// user will enter 2*10 cent    (5 cent money remaining)
// user will enter 1*5 cent and 1*10 cent (no money remaining)


`timescale 1ns / 1ps
module vending_machine(
    input clk,                  //active high clk
    input reset,                //active low reset
    input coin_in_en,           //active high when 1 user enter coin
    input coin_val,             //when 0 user wnter 5 cent, when 1 user enter 10 cent

    output pencil_out,          //when 1 the pecile will out from vending machine
    output [2:0]extra_money     // when 1 the machine will back 5 cent for the user as remaining money
    );
```

- Write Verilog code which implement the above function
- Write self-check testbench which generate the above 3 examples and check the outputs [put screenshots for the simulation]
- Write constraint file to make the following connection:
    - Connect clk to push button
    - Connect reset to push button
    - Connect coin_in_en to push button
    - Connect coin_val to dip switches
    - Connect pencil_out to LED
    - Connect extra_money to seven segments. You need to add seven segments driver.

- Using the help of Vivado:
    - Get the schematic of the design
    - Get the synthesis report
    - Get the timing report
- Test the design on Nexys A7 100T board and put screenshots for the board output

Good Luck

Remember Education is permanent, Grades are Temporary