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Course Name	:	Digital Electronics		Exam	:	Final Exam
Course Code	:	ECE 375		Examiner	:	Dr. Saied M. Abd El-atty

Answer the following Questions

Question 1 (10M)

a) Design a 4 bit shift register. Give an illustrative example, if the initial value is 0010 and there is 5 clocks and the input changes from 1 to 0 after clock 2. (2M)

b) What is the difference between 3bit ripple counter and 3bit synchronous counter? (2M)

c) Design a Mod-5 synchronous counter using J-K Flip-Flops. (6M)

Question 2 (6M)

As an electronic engineer, you have given the following Boolean function (F)

$$F(W,X,Y,Z) = \sum m(1,3,4,11,12,13,14,15)$$

i) implement F by using 4×1 MUX and external gates, when the inputs W and X are only used as selection lines?

ii) implement F by using two 8×1 MUX

iii) implement F by decoder

Question 3 (9M)

a) What is the types of PLDs. State the advantages of PLDs and what the difference between PROM, PAL and PLA? (3M)

b) Design a full adder by the following IC PLDs (6M)

   i) PROM   ii) PAL   iii) PLA

Question 4 (15M)

a) Describe the major types of sequential PLDs. Use figures to explain your answer. (3M)

b) Define look up table (LUT). Suppose we want to realize a Boolean Function of four input variables A, B, C and D using FPGA with 4-input LUT. Let the output is <u>high</u> only when any of the two input variables are <u>1</u>. Give illustrative example for the output when the inputs is 0111. What do we do when our FPGA does not have a 4-input LUT, but only 3-input LUTs? Can we implement our function in it? How? (7M)

c) Write a VHDL Programming Code for the following function (5M)

$$F = (A \oplus BC) + (\overline{A + C})$$

Draw the digital electronic circuit and time diagram.

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Best wishes
Dr. Saied M. Abd El-atty

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