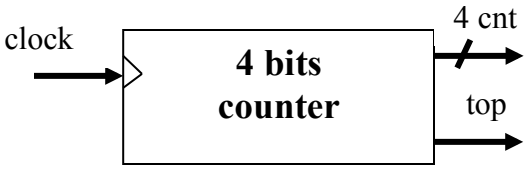
CS 4833 (Embedded Systems) Homework 1: due Oct. 4, 2018

Name: _____ UTSA ID (abc123) _____

Q-1[5 points]: What are embedded systems? And give at least 3 **examples** of embedded systems.

Q-2 [6 points]: Briefly explain the fundamental differences between **combinational** and **sequential logical circuits**.

Q-3 [6 points]: Suppose that the clock frequency is **1MHz**, and your have **THREE 4-bit counters (which are shown as follows)**, what is the maximum interval can you get and how should you design your cascaded timer (draw a figure to illustrate)?



Q-4 [5 points]: For assembly language, list the **three types** of instructions.

Q-5 [6 points]: Illustrate and explain at least **three different address modes**.

Q-6 [6 points]: Suppose that there are three (3) input signals (A, B and C), and two output (X, Y). Draw the figure and use the **logical gates with only two input** to implement the following functions:

$$X = A'B+B'C, \text{ and } Y = A + A'BC'.$$

Q-7 [8 points]: Suppose that there are **three (3) different technologies** that Apple can use for designing their next generation of iPhone. Technology A will take 3 months with NRE cost of $10,000,000 and the unit hardware cost is $300; Technology B will take 6 months with NRE cost of $30,000,000 and the unit hardware cost is $150, and technology C will take one year with NRE cost of $120,000,000 and the unit hardware cost is $100. Now, if you are the chief technology officer (CTO) of Apple, **to minimize the overall unit cost** of each new iPhone, which technology will you choose if your target sale volume is 100,000 units? What about 100,000,000?

Q-8 [8 points]: For A/D conversion, suppose the input range is 0 to 15 V with 6 bits encoding. That is, 15V → 111111. Calculate the correct encoding for 5.5 V using the **successive approximation approach**. Show the steps for each bit.