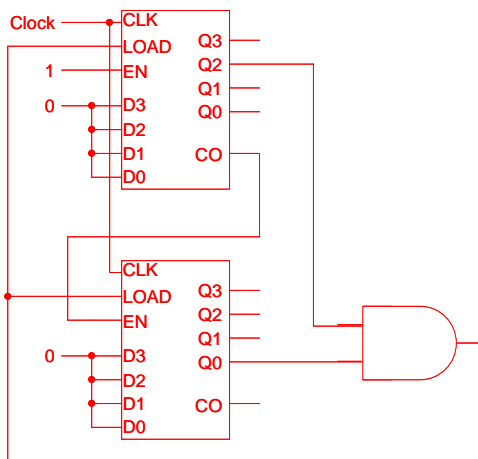


King Fahd University of Petroleum and Minerals  
College of Computer Sciences and Engineering  
Department of Computer Engineering

**COE 202 – Fundamentals of Computer Engineering (T121)**

**CAD Assignment # 02 (due date & time: Monday 24/12/2012 during class period)**

Using the “LogicWorks” tool, build the following counter circuit:



Note the counter uses 5 bits  $b_4b_3b_2b_1b_0$  to be able to count from 0 to 20. The counter at the top of the diagram will represent  $b_3, b_2, b_1,$  and  $b_0$ , using Q3, Q2, Q1, and Q0, respectively. On the other hand, the counter at the bottom of the diagram will represent  $b_4$  using Q0.

Label the clock, the “LOAD,” and all counter states. Verify that your circuit is functioning properly by stepping through the counts from 0 to 20 and then back to 0.

You can use the “74\_163” rising-edge triggered binary counter under the “7400devs” library, the “Hex Display” under the “Simulation IO” library to display the states of the counter, and the “Clock” device under the “Simulation IO” library for the circuit implementation.

Set the “Delay.Dev” under the clock attributes to “50,50”. Also, set the “Triggers” to “Every 25 time units, Reference Line” (see tutorial on the website). Make sure to use the “Single step” mode when applying the clock to the circuit. Also, make sure that you initially clear the states of the counter in the first clock cycle by using the “CLR” pin once. Moreover, connect the “T” pin of the counter to “+5V” found under the “Connect” library. Note that the “P” pin of the counter acts as an “Enable” pin such that when the “P” pin is connected to logic “0” the counting is disabled, and when the “P” pin is connected to logic “1” the counting is enabled. Therefore, make use of the “P” pin in your counter design.

Save your circuit and name the file “CAD02\_yourStudentID.cct”.

**Deliverables:**

1. Send a soft copy of your circuit file to both myself ([marwan@kfupm.edu.sa](mailto:marwan@kfupm.edu.sa)) and the grader ([s200832420@kfupm.edu.sa](mailto:s200832420@kfupm.edu.sa)) with the “subject” line being “COE202-CAD02-yourStudentID”.
2. Submit a printout of the circuit window. Make sure that the entire circuit appears in the printout.
3. Submit a printout of the timing window after stepping through the counts from 0 to 20 and then back to 0. Make sure that the entire timing appears in the printout.