University of Puerto Rico – Río Piedras
Department of Computer Science
Final Exam - Part II
CCOM 5060 - Parallel Processing
Prof. Edusmildo Orozco
May , 2012
Due date: Tuesday, May 16 before 1:45pm
Team Work: Two members

Name:_____ ID:_____ Grade:_____

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Part II: (100 points) Hybrid Parallel Programming Problem.

Instructions: Provide:

a. (**15 points**) A pseudocode describing the algorithms.
b. (**5 points**) A data or task dependency graph, whichever is applicable
c. (**10 points**) A separate text file called readme.txt which contains all instructions to compile and run your program.
d. (**50 points**) A running hybrid program in MPI-OpenMP-C/C++.
e. (**10 points**) Documentation inside your program explaining each part of the code.
f. (**5 points**) Table of running times with different number of processors.
g. (**5 points**) Table of Speedups with different number of processors.
h. Prepare a zip folder containing all files, except executable code and send it to edusmildo.orozco@gmail.com by the stablished date.

For the coding part, you can use your knuth.uprrp.edu account or your own machine with MPI and OpenMP installed in it. Also, you can use all material from the course as well as from any other reliable, legal and ethical source* (i.e., www.citutor.org, books, etc). The use of the Rocks Cluster is exclusive for running programs that are ready for production.

Each item a - h must reflect the contribution of both team members. Accordingly, each team-member is accountable for the final score. Any conflict should be informed prior to the submission date.

Problem: Write a hybrid program with both MPI function calls and OpenMP pragmas that solves a dense $n \times n$ system of linear equations over $\mathbf{Z}_p$, the integers modulus a prime p, using Gaussian elimination and followed by back substitution. Benchmark your program for various values of n and N, where N is the number of processors used, as indicated in items f and g.

**Please exercise the Ethics code prevailing at the UPR regarding academic honesty.*