

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND

COLÁISTE hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

Winter Paper 2013

BSc in Computer Science

CS4402: Parallel and GridComputing

Professor B. O'Sullivan

Dr. S. Tabirca

Answer all Questions

Time: 1.5 Hours

Question 1. MPI Programming

- (a) Give the full prototype and explain the following MPI routines: MPI_Scatter(), MPI_Reduce(). **(10 marks)**
- (b) Write an MPI routine to calculate the sum of the elements of the array $a=(a[i], i=0,1,\dots,n)$ using only collective communication routines. **(20 marks)**
- (c) Explain the Gustafsson's laws and state its consequences. **(20 marks)**

Question 2. Parallel Algorithms

- (a) Develop an **MPI routine** for the ranking sort. **(20 marks)**
- (b) Evaluate the complexity of this sort considering both communication and computation. **(10 marks)**
- (c) Calculate the speedup of this parallel sort considering the sequential complexity of the sort as $O(n^2)$. **(10 marks)**
- (d) Identify some negative facts about this parallel sort. **(10 marks)**