Ceng 471 & Ceng 505 Parallel Computing
Final
Jan 27, 2009 17.30–19.30
Good Luck!

1 (40 Pts) Summation of numbers is performed both in serial and parallel ways. For parallel computation, the environment is the networked workstations and the sequential computation is also done in the same cluster. The following table is obtained;

TIME	$nproc = 1$	$nproc = 2$	$nproc = 3$	$nproc = 4$	$nproc = 5$	$nproc = 6$
100	0.013541	0.015713	0.015420	0.017393	0.018216	0.025741
200	0.018175	0.018387	0.019951	0.022900	0.026010	0.030067
500	0.036738	0.027887	0.032696	0.041647	0.433383	0.049059
1000	0.072881	0.047775	0.060789	0.093839	0.097799	0.113722
2000	0.145120	0.078808	0.111233	0.188817	0.143317	0.211288
5000	0.365731	0.197714	0.269206	0.313151	0.371891	0.347993
10000	0.749948	0.390106	0.507074	0.636745	0.665334	0.705855
20000	1.571937	0.865633	1.086707	1.225067	1.273847	1.338983

   i Complete the following tables.

Speed-Up	$nproc = 2$	$nproc = 3$	$nproc = 4$	$nproc = 5$	$nproc = 6$
100	0.86	0.88	0.78		
200	0.99	0.91	0.79		
500	1.32	1.12	0.88		
1000	1.53	1.2	0.78		
2000	1.84	1.3	0.77		
5000	1.85	1.36	1.17		
10000	1.92	1.48	1.18		
20000	1.82	1.45	1.28		

Efficiency	$nproc = 2$	$nproc = 3$	$nproc = 4$	$nproc = 5$	$nproc = 6$
100	0.43	0.29	0.19		
200	0.49	0.3	0.2		
500	0.66	0.37	0.22		
1000	0.76	0.4	0.19		
2000	0.92	0.43	0.19		
5000	0.92	0.45	0.29		
10000	0.96	0.49	0.29		
20000	0.91	0.48	0.32		

1

ii Analyze the tables in detail.

iii How many processor should be used for a specific value of N? Why?

iv Given the following table. The values are found as $(TIME/N) * 10000$

N	$nproc = 2$	$nproc = 3$	$nproc = 4$	$nproc = 5$	$nproc = 6$
100	1.571300	1.542000	1.739300	1.821600	2.574100
200	0.919350	0.997550	1.145000	1.300500	1.503350
500	0.557740	0.653920	0.832940	8.667660	0.981180
1000	0.477750	0.607890	0.938390	0.977990	1.137220
2000	0.394040	0.556165	0.944085	0.716585	1.056440
5000	0.395428	0.538412	0.626302	0.743782	0.695986
10000	0.390106	0.507074	0.636745	0.665334	0.705855
20000	0.432817	0.543354	0.612534	0.636924	0.669492

Can we estimate the N value(s) for each column that communication time overheads computation time?

2 (30 Pts) Answer the following questions, **choose only 5 of them.**

   i Describe the Flynn's classification for computers. Which type of the computer we have made use of?

  ii Is it possible to have a system efficiency (E) of greater than %100? Discuss.

 iii Describe Blocking and Nonblocking Message-Passing.

 iv Compare the point-to-point and collective communications.

   v What is embarrassingly parallel computations? Explain by an example.

 vi What is the data parallel computations? Example it.

 vii Describe load balancing.

viii What could be your criteria to choose a shared- or distributed-memory programming technique.

 ix What is the difference between SIMD and SPMD models?

  x What are the main advantages of the compute clusters (Beowulf clusters)?

 xi Discuss the concept of communication overhead.

3 (30 Pts) Discuss the parallel programming/computing aspects of your presentation topic.