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**Homework Assignment 3**

Q1.

1. The time it will take to calculate n numbers is:

98tw – communicate number lists (input) and communicate results (output)

(n/50 - 1)\*tc – number of addition times the time it takes to do them

49tc – the number of additions for communicating results (output of each list of numbers).

Thus, 98tw + 49tc + (n/50 -1)tc.

1. The time it will take to cal. N numbers is:

96tw – communicate number lists (input) and communicate results (output)

(n/50 - 1)\*tc – number of addition times the time it takes to do them

49tc – the number of additions for communicating results (output of each list of numbers).

Thus, 96tw + 49tc + (n/50 -1)tc.

Q2.

1. MPPs does not share data between segments. Data is distributed between multiple segment’s physical memory.
2. A single computer can be taken out of the cluster for maintenance. Scalability can be done in smaller increments.
3. Because of shared memory DSMs have a larger physical memory size available by combining each node’s individual memory. Simpler data sharing due to shared memory.
4. GPUs have optimized data throughput with instruction pipelining.
5. CPU multicores have dedicated cache for each processor and feature temporal isolation, meaning one core’s performance does not negatively affect another’s.

Q3.

1. Maximum speedup is 1/6.
2. 2 units of time is the upper bound.
3. 10 processors.
4. If input and output tasks can be run in parallel (input pair with output) then:

2 serial tasks -> 10 serial tasks

10 parallel tasks -> 50 parallel tasks

T1= 10u + 50u = 60u

T2= 6u (1st input + last output + 4 input/output pairs) + 25u = 31u

Speedup = 60u/31u = 1.935

Otherwise, if input and output cannot be parallelized then:

T2= 10u + 25u = 35u

Speedup = 60/35 = 1.714

1. T1= 1200(200 serial + 1000 parallel)

F = 1/6 (200/1200 are not parallizable)

Upperbound of the speedup = 1/f = 6

1. 11 processors

Q4. I don’t know how to answer this.

Q5. What is lamda= 100X? I don’t know how to answer this.

Q6.

1. The advantage of a smaller parallel machine with very powerful processors is the ability to process multiple course-grained programs simultaneously. Multicore CPUs would fall under this type of machine and are suitable for operating systems and managing multiple programs like a internet browser, word, and a music player all at the same time
2. The advantage of a large parallel computer with weak processors is the ability to execute a single instruction over a multitude of processors. For example, if there is a 3 x 1024 matrix and each number in the matrix is being scaled by k then this type of parallel processor would work efficiently since the processors are only multiplying each number by k. I think GPUs are of this type of machine.
3. Depends on what you mean with this question, I think. If you mean that it can solve a very particular problem like “is graph A isomorphic to graph B?” the yes, I am sure it can solve that. However, if you mean to find every solution that is isomorphic to graph A then I do not think a parallel processing computer could solve it because it would require exponential resources.
4. There is no difference.
5. GPUs are single instruction not multiple instructions.