EECS 645 – Homework #01 Solutions

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Assigned: January 25, 2018
Due (in class): February 1, 2018

The following questions are on the first EECS 645 homework assignment. The assignment will be posted on the class website.

1. Given System_A computes a task in 11.46 hours and System_B completes the same task in 12.34 hours, what is the speed up of System_A with respect to System_B?

$S_{A|B}$ = $Time_B$ / $Time_A$ = 12.34 / 11.46 = 1.07

2. CPU_A executes an ADD instruction in 0.09 nS and CPU_B executes an ADD instruction in 0.064 nS. What is the speed up of CPU_B with respect to CPU_A for the ADD instruction?

$S_{B|A}$ = $Time_A$ / $Time_B$ = 0.09 / 0.064 = 1.40

3. A 10 KM section of highway has a posted speed limit of 120 KM/Hr for 9 KM and 60 KM/Hr for 1 KM. Assume driving the posted speed limit. What is the average speed on this 10 KM section of highway?

It takes T_{120} = 0.075 hours to travel the 9 KM. It takes T_{60} = 0.016 hours to travel the 1 KM. The total time is 0.916 hours for an average speed of <u>109.09 KM/Hr</u>.

4. A CPU pipeline has seven (7) stages. Each stage takes 1 nS to execute. An execution sequence has 500 input value pairs to compute 500 result values.
(A) How long does it take for the first result value to be computed?
(B) How long does it take for the entire sequence to be computed?

It takes 7 nS for the first result to be computed.

Time = (7 * 1 nS) + (499 * 1 nS) = 506 nS.

5. A parallel computer system has eight (8) processors that operate in parallel. An application can use these eight processors for 95% of the algorithm. The remaining 5% is serial. What is the speed-up of this system compared to a single processor system?

The time of System_B is:

$Time_B$ = (1-0.95) + (0.95/8) = 0.17

Speedup (normalized to a single processor) is:

S_p = 1.0/ $Time_B$ = 1.0 / 0.17 = 5.92

6. What does the acronym SISD stand for?

Single Instruction Single Data

The ITTC Cluster is described at: https://help.ittc.ku.edu/Cluster_Hardware

7. How many nodes are in the ITTC Cluster?

188 are listed in the table. The table lists 189.

8. How many CPU cores are in the ITTC Cluster?

There are 376 CPU cores in the ITTC Cluster.

9. What is the total amount of main memory in the ITTC Cluster?

If you total the memory listed, you get 2535.03 GB. If you take the memory listed as the memory per CPU, you get 5054.55 GB.

10. What is the maximum memory on a node in the ITTC Cluster?

The maximum memory on a node is 503.71 GB.