

Foundations to Parallel Computing

Define the following: Task, Pipelining, Shared Memory, Communications, Synchronization. (in your own words) –

Task is a set of instruction that a computer executes as instructed by the programmer

Shared Memory- It's a like a public road that's open to public likewise shared memory is a memory where different processes can have access to it.

Communication- Simultaneous tasks communicate through data buses to exchange data and share memory during parallel computing.

Synchronization is a communication between different tasks to make sure the task is performed before starting to execute the next text within the parallel computation through synchronization point

(8p) Classify parallel computers based on Flynn's taxonomy. Briefly describe every one of them. - (7p) What are the Parallel Programming Models? **Flynn classified parallel computers in the following categories. Single Instruction stream Single Data Stream (SISD) 2) Single Instruction stream Multiple Data Stream (SIMD), 3) Multiple Instruction Stream Single Data Stream (MISD) ,4) Multiple Instruction Stream Multiple Data Stream (MIMD).**

Single instruction, single Data (SISD) is where only one instruction visited by the CPU with in one clock cycle and one data from a single source delivered to the CPU within a single clock cycle.

Single instruction, Multiple Data is where the processors execute similar instruction within any clock cycle however, they can take care of separate dates from different data streams.

Multiple instruction, Single Data delivered to different processing units and each of them operate those data in separate instruction streams.

Multiple Instruction, Multiple Data – All processors work on different instruction sets and receive a data from separate data streams.

(12p) List and briefly describe the types of Parallel Computer Memory Architectures. What type is used by OpenMP and why?

Parallel Computer Memory Architectures divided in to two as Uniform Memory Access (UMA) and Non-Uniform Memory Access. Uniform Memory access is where the CPU shares the common memory or single memory to do parallel computing, where us the Non-Uniform Memory access is where multiple memories can be accessed by the processors through different Buses connecting them to the CPU.

- (10p) Compare Shared Memory Model with Threads Model? (in your own words and show pictures)

In shared Memory Model, processes share a common address space to read and write a data but in Threads model processes have a multiple address space to read and write the data and execute a process.

- (5p) What is Parallel Programming? (in your own words) –

Parallel Programming is the execution of different processes or instructions simultaneously by the processor.

(5p) What is system on chip (SoC)? Does Raspberry PI use system on SoC?

System on chip (SoC) is a processing unit where all the processing components or other components of the computer stacked on one single chip. Yes, the Raspberry PI use Soc. It doesn't have separate CPU.

- (5p) Explain what the advantages are of having a System on a Chip rather than separate CPU, GPU and RAM components. **It has advantage over CPU by the following cases: Portable due to its size, power efficient, cost reducing since it's cheaper to build a computer on a single chip rather than separate chips.**