

Task 3 a) Q. 1~3

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

Task: A set of program instructions that are loaded in memory.

Pipelining: It consists of breaking up the operations to be performed into simpler independent operations, sort of like breaking up the operations of assembling a car in an assembly line.

Shared Memory: In hardware point of view, all processors can directly access all memory locations in the system, thus providing a convenient mechanism for processors to communicate. In programming point of view, shared memory is a method by which program processes can exchange data more quickly than by reading and writing using the regular operating system services.

Communications: The process of exchanging information or data from one computer to another computer or device.

Synchronization: The idea that multiple processes are to link or handshake at a certain point, so as to reach an agreement or commit to a certain sequence of action.

**Classify parallel computers based on Flynn's taxonomy. Briefly describe every one of them.**

Single-instruction, single-data (SISD) systems:

An SISD computing system is a serial computer which is capable of executing a single instruction, operating on a single data stream. In SISD, machine instructions are processed in a sequential manner. This is the oldest type of computer

Single-instruction, multiple-data (SIMD) systems:

An SIMD computing system is a type of parallel computer capable of executing the same instruction on all the CPUs but operating on different data streams. Machines based on an SIMD model are well suited to scientific computing since they involve lots of vector and matrix operations. The two varieties are processor arrays and vector pipelines.

Multiple-instruction, single-data (MISD) systems:

An MISD computing system is a type of parallel computer capable of executing different instructions on different processing elements but all of them operating on the same dataset. The system performs different operations on the same data set. Machines built using the MISD model are not useful in most of the application, a few machines are built, but none of them are available commercially.

Multiple-instruction, multiple-data (MIMD) systems:

An MIMD computing system is a type of parallel computer which is capable of executing multiple instructions on multiple data sets. Each processing elements in the MIMD model has separate instruction and data streams; therefore, machines built using this model are capable to any kind of application. Unlike SIMD and MISD machines, processing elements in MIMD machines work asynchronously.

### **What are the Parallel Programming Models?**

The most common parallel programming models are Shared Memory, Threads, Distributed Memory / Message Passing, Data Parallel, Hybrid, Single Program Multiple Data (SPMD), and Multiple Program Multiple Data (MPMD)