**- (5p) Define the following: Task, Pipelining, Shared Memory, Communications, Synchronization. (in your own words)**Task – Instructions that are to be executed by processor.   
Pipelining - This is dividing up task into different processing units.   
Shared Memory – The location in where the processor has direct access to RAM. Also location where memory can be accessed regardless of existence.   
Communications – Exchanged data between parallel task.  
Synchronization – Coordination of task. **- (8p) Classify parallel computers based on Flynn's taxonomy. Briefly describe every one of them.**SIMD – stands for Single Instruction, Multiple Data. It contains two types called Processor Arrays and Vector Pipelines. Single Instructions references when only one instruction is executed on a CPU cycle and Multiple is when each processing unit can be diversified.

SISD – Stands for Single Instruction Single Data. This is not parallel but rather means there is only one instruction that will execute during a CPU cycle.

MIMD – Stands for multiple instruction, multiple data. This utilizes both the benefits of different data sources and instructions. SuperComputers use this because they can operate complex functions in different allocated processors or through separate instruction streams.  **- (7p) What are the Parallel Programming Models?**

* Shared Memory (w/out threads)
* Threads – A type of shared memory programming. Usually used in libraries/compiler directives (i.e. OpenMP).
* Distributed Memory/Message Passing – Distributed memory means that memory is physically distributed across a network of machines through specialized hardware and software.
* Hybrid
* Data Parallel
* Single Program Multiple Data (SPMD)
* Multiple Program Multiple Data (MPMD)

**- (12p) List and briefly describe the types of Parallel Computer Memory Architectures. What type is used by OpenMP and why?**UMA stands for uniform memory access and is when machines have processors that have the same access time to memory as. It also supports parallel functionality where if one is updated for cache all are updated.

NUMA stands for Non-Uniform Memory Access. These are machines built on multiple SMP’s that don’t have the same access time as UMA. These are typically(mostly) slower.

OpenMP utilizes UMA due to the way it models the memory locations and the access time for each.  **- (10p) Compare Shared Memory Model with Threads Model? (in your own words and show pictures)**The main difference is within the thread model where you can control how much is allocated in a program; however, the shared memory model is an original concept where task are set in an isolated environment to be written / read from.  **- (5p) What is Parallel Programming? (in your own words)**Parallel programming is the distribution of resources (threads / cores) (processing power) to carry out task and execute instructions in a case by case format.  **- (5p) What is system on chip (SoC)? Does Raspberry PI use system on SoC? - (5p) Explain what the advantages are of having a System on a Chip rather than separate CPU, GPU and RAM components.**A Soc is similar to that of a shrink ray, because it really helps in minimization in the sense that you can manage output and optimize for spacing in devices. Since it emulates the components of a standard computer, you can get great functionality and open space for other components.