Assignment NO#01

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**Q1.What is pipelining? How does pipelining improve performance?**

**Pipelining**

It is the process which deals with the arrangement of hardware elements of the system in a way which elevates its overall performance. In this process more than one command takes place simultaneously in the processor.

There are two ways by which the performance of the CPU can be increased.

1. Induce faster circuits in the hardware to improve the performance.
2. Arrangement of the hardware in a way so it can execute more than one operation at a time.

However speed of hardware is limited to certain limits and fast circuits have high cost so second option is much more convenient.

**Q2.Which is better single core or quad core?**

Single core refers to single CPU where as quad core refers to four CPU. By using single arm (1 CPU) multiple threads and tasks can be established where as quad core is doing the same but responsiveness is much higher than the single core.

There are certain benefits of both of the technologies but quad core has an edge which made this better over single core. In quad core single chip contain four individual processors which run separately at their respective speed in way so that it can execute the job quicker as compare to single core CPU.

**For Example:**

Four Tim Henmans is playing at same time against single Roger Federer however Tim may not be the better player but there is no competition exist between four vs one.

**Q3.What does Core i5 mean? How many GHz is an i5 processor?**

Core i5 is an intel exclusive processor that is made on the architecture of multiprocessor framework. It is basically the type of quad core processor which is build using several micro architecture such as Lynnfield, Clark Dale, Sandy Bridge, Ivy Bridge, Haswell. It can be installed in mobile, desktop and embedded devices.

Core i5 processor accessible in different speeds that ranges from 1.90 GHz to 3.80 GHz which comprises of cache 3MB,4MB,6MB.It can use one of the socket on a motherboard i.e. is LGA 1150 or LGA 1155.

**Q4.Compare GPU vs. CPU. What Matters Most for PC Gaming?**

**CPU**

1. CPU has fast caches which is great for data reuse.
2. It has fine branching granularity.
3. It has lots of threads and processes.
4. It has high performance on the execution of single thread.
5. It is great for task parallelism.

**GPU**

1. It contains lot of math unit.
2. It has fast excess to on board memory.
3. It can execute a program on every fragment.
4. It can produce high throughput on tasks which is parallel.
5. It is great for data parallelism

There are two things that matters most for gaming PC one is video quality and other is graphics performance. GPU is the single chip processor which plays very crucial role in gaming as it enhances both video and graphics as well.

**Q5.What is hyper threading and how does it work?**

**Hyper threading**

Hyper threading is defined as the process which enables the CPU to perform or handle two threads or processes simultaneously by the core. By the use of hyper threading the basic purpose is to turn down the time of execution for a particular task in a single core. It has an advantage of the superscalar architecture in which separate data is being queued by a single core to perform multiple instructions.

Some of the advantages of hyper threading are as follows.

1. It can execute demanding applications at the same time while maintaining system responsiveness as well.
2. It protects the system while managing efficiently as well without hurting the productivity.

**Working Procedure**

There is a chip inside the system which contains several cores. Every central unit responsible for execution, two sets of registers and all the other resources are being contained by core. By which it switch very fast.

By separating its time between two threads, service can be provided by the execution unit to both in what appears to be the real time.

It sometimes can be described as arrangement which represent two cores one is physical and the other id virtual one. But in real they both are actually half real and half virtual.

**Q6.What is CISC used for? Is Intel RISC or CISC?**

CISC is basically stands for “Complex instruction set computing”. By using only one instruction set it can execute multi step operation or addressing modes. CISC architecture is basically used by the Low end applications for example security systems, home automation etc.

It is very difficult now to classify whether the processor is

RISC or CISC because RISC also use complicated hardware for the executioner of super scalar and their instruction sets is almost look similar. There is certain advantage and disadvantage associated with both technologies. However if we talk about an Intel so it is using CISC up till now where the whole world is crazy about the RISC and enjoys the benefit of software support.

**Q7.What is dual interleaved memory channel mode?**

Dual interleaved memory channel mode can be defined as the mode which present memory of higher throughput and it also permit the capacities of memory of both DIMM channels are equal. But when we used different DIMMs speed so the usage of slowest memory is take place.

There are also certain rules associated to enable dual channel mode. In order to obtain this mode following conditions have to be met.

1. The memory size should be same.
2. The configuration of each channel should be matched with the DIMM.
3. They should be match in a slots of memory that are symmetrical.

**Q8.Compare Hardware and Software parallelism**

**Hardware Parallelism**

1. It is the type of parallelism described by the machine architecture and hardware multiplicity.
2. It is basically the function of cost and performance tradeoffs. It shows the pattern of resource utilization of the operations that are executes at the same time.
3. By this number of instruction issues for single machine cycle can be characterized .
4. In an advance processor two or more than two instructions can be issued per machine cycle.

**Software Parallelism**

1. It is the type of parallelism which described by the data and control dependence of programs.
2. The program profiler and program flow graph is represents the degree of parallelism.
3. It is basically the function of algorithm, programming style and compiler optimization.
4. Parallelism in a program varies during the execution period and limits the continuous processor performance.

**Q9.Explain vector processing. What is the difference between vector & array processing?**

**Vector Processing**

It can be defined as the array having at least two indices technically. It also represents as the block of computer data.

There is certain difference between scalar and vector processes.

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| **Array Processing** | **Vector Processing** |
| It is not synchronized. | It is synchronized. |
| It is not thread safe because it allowed multiple threads to operate on its object. | It is thread safe as it enable only one thread to operate on a vector object. |
| The relative performance is high threads are not required to wait to operate on array list. | The relative performance is low as threads have to wait to operate on a vector object. |
| It is not legacy class because it introduce in 1.2 version. | It is introduce in 1.0 version hence counted as legacy class. |

**Q10.Why is branch prediction so important? Does multiple issues increase or decrease the need for such prediction?**

Branch prediction is very important in order to guess the results of a conditional operation and prepare for the most likely outcome. It is executed by using digital circuit known as “Brach Predictor” and considered to be the most important part of modern CPU architecture.

Multiple issues decrease the need for such prediction because mostly architecture has their branch predictor per hardware thread but if the code is not run on the multiple issue so the prediction will be 100% every time with a cost of few instructions but if you run the code on the multiple issues so you will find your life in hell with 50% mispredict.