IT2164/IT2561 Operating Systems

# Tutorial 3

**Computer Organization**

Attempt the following questions before you attend tutorial.

Note: coding is converted to the assembly language (is registers – R3, R4). The assembly language is compiled to machine language (with 0 and 1) for the computer to understand.

1. On what architecture is the modern computer based on? Briefly describe the architecture.

* Von Neuman architecture – 1) CPU 2) primary memory unit 3) collection of I/O devices 4) buses to interconnect the components

Ans: The modern computer is based on the Von Neumann architecture. It has a fixed set of electronic parts, which can be made to perform various tasks by a variable program It consists of

1. A central processing unit (CPU)
2. Primary memory unit
3. I/O devices
4. Buses to interconnect these components

1. What algorithm does the control unit follow? Briefly describe the algorithm.

* Fetch-execute cycle.
* Control unit – manage the flow of the CPU.
* The program is first loaded on RAM (that is why Ram must be high when you buy a laptop to do programs)

Ans: The control unit works based on the fetch-execute algorithm. In the fetch phase, the instruction is retrieved from memory, and in the execute phase, the ALU operates on the instruction.

1. What are the 3 main registers that are used by the CPU to interact with the main memory?

* Memory address register
* Memory data register
* Command register

Ans:

They are:

* memory address register (MAR)
* Memory data register (MDR)
* Command register (CMD)

1. Why do we want to have the CPU’s operation overlap with that of the I/O processing?

* Car wash example – more efficient, save time

Ans: This is because I/O is usually much slower than CPU. To have the CPU wait for the I/O to finish is to waste precious CPU time. Therefore, if we can overlap I/O with CPU processing of other processes. This way we can reduce the overall time required to run all the processes.

1. What are the 2 ways in which the CPU can be notified of the completion of an I/O operation?

* Polling
* Interrupt

Ans: The methods are polling and using an interrupt request flag.

1. What is DMA? What information do you think the CPU needs to provide the DMA controller to issue a memory transfer operation?

* DMA – direct memory access

Ans: DMA stands for direct memory access and it allows data transfer between I/O devices and memory without CPU intervention. The information needed to be provided by the CPU include:  
- the I/O device

* The memory location which the data is to be transferred to/from
* The amount of data to transfer.

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