

- 6%
1. What is the memory cycle time? What is the memory access time?
- 8%
2. Explain what is the daisy chain. Propose two computer system's mechanisms whose design may use daisy chain technology.
- 12%
3. DMA can allow a computer system to perform I/O without the CPU interfere. Draw the block diagram of a single bus computer system that uses the DMA to perform Disk I/O. Explain how does this system transfer a block of data while performing a disk write operation.
- 12%
4. Compare the difference between physical address space and logical address space and explain why a system supporting virtual memory can run the programs whose program sizes are larger than the size of physical memory in the system.
- 8%
5. Using a 8 bit register to describe the following operations
- logical right shift
 - logical left shift
 - arithmetic right shift
 - arithmetic left shift
- 10%
6. CPU have three basic instruction cycles: Fetch, Execution and Interrupt cycles. Describe the operations that a CPU will perform in these three cycles, respectively.
- 10%
7. Explain why the designers of RISC suggest a large size of register file (In general, near or more than 100 registers).
- 10%
8. Explain the following terminologies:
- Horizontal microinstruction/Vertical microinstructions
 - Synchronous communication /Asynchronous communications
 - Tightly/Loosely coupled Multiprocessor systems
 - Superscaler/Superpipeline
 - Vector processor/Array Processor
- 12%
9. Design a synchronous BCD counter with JK flip/flops.
- 12%
10. Design a circuit that compares two 4-bit numbers, A and B, to check if they are equal. The circuit has one output x, so that $x=1$ if $A=B$, and $x=0$ if $A < B$.