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**Slot01-CH01-CourseIntroduction**

**Question 1: What, in general terms, is the distinction between computer organization and computer architecture?**

* **Computer architecture** refers to those attributes of a system visible to a

programmer or, put another way, those attributes that have a direct impact on

the logical execution of a program.

* **Computer organization** refers to the operational units and their

interconnections that realize the architectural specifications.

**Question 2: What, in general terms, is the distinction between computer structure and computer function?**

* Computer structure: The way in which the components are interrelated
* Function: The operation of each individual component as part of the structure.

**Question 3: What are the four main functions of a computer?**

**4 functions:** Data processing., data movement, data storage, control

**Question 4: List and briefly define the main structural components of a computer.**

* **Central Processing unit (CPU):** Control the operation of the computer and performs its data processing functions
* **Main memory:** Stores data
* **I/O:** Move data from computers to external environment and back.
* **System interconnection (system bus):** provide a connection among computer’s components.

**Question 5: List and briefly define the main structural components of a processor.**

* **Control Unit:** Control operation of the CPU and the computer.
* **Arithmetic and logic unit (ALU):** Perform the data processing functions.

* **Register:** Provides storage internal to the CPU.
* **CPU interconnection:** provide a connection between Control Unit, Arithmetic and logic unit and register.

**Short answer:**

01. Computer architecture refers to those attributes of a system visible to a programmer.

02. Computer organization refers to the operational units and their interconnections that realize the architectural specifications.

03. Control signals, interfaces between the computer and peripherals, and the memory technology used are all examples of organizational attributes.

04. The instruction set, the number of bits used to represent various data types, I/O mechanisms and techniques for addressing memory are all examples of architectural attributes.

05. The 370 architecture is the architecture of IBM’s mainframe product line.

06. Structure is the way in which the components are interrelated.

07. Function is the operation of each individual component as part of the structure.

08. The basic functions that a computer can perform are: data processing, data movement, control, and data storage.

09. When data are received from or delivered to a device that is directly connected to the computer, the process is known as I/O.

10. The four main structural components of the computer are: main memory, I/O, system interconnection, and CPU.

11. Often referred to as processor the CPU controls the operation of the computer and performs its data processing functions.

12. A common example of system interconnection is by means of a system bus consisting of a number of conducting wires to which all the other components attach

13. The major structural components of the CPU are: control unit, register, CPU interconnection, and ALU.

14. The control unit controls the operation of the CPU and hence the computer.

**Slot02-03-CH02-ComputerEvolutionAndPerformace**

**Question 1: What is a stored program computer?**

* Attributed to the ENIAC designer, represented in a form suitable for storing in memory alongside the data

**Question 2: What are the four main components of any general-purpose computer?**

* **The four main components:** main memory, arithmetic and logic unit, control unit, input-output (I/O)

**Question 3: At the integrated circuit level, what are the three principal constituents of a computer system?**

* 3 principal constituents of a computer system: gates, memory cells, and interconnections among the elements.

**Question 4: Explain Moore’s law.**

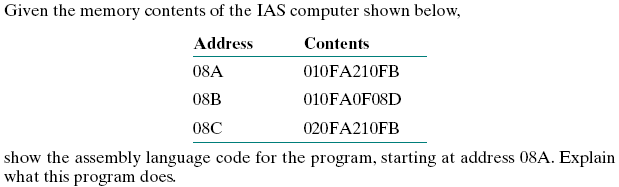
* Moore’s law said that the number of transistors that could be put on a single chip can be doubled every year and be able to continue in the near future.

**Question 5: List and explain the key characteristics of a computer family.**

* **Similar or identical instruction set:** A computer in the same family can run any programs that can be run in another computer in their circles. Some programs are written for lower end and can be run in higher end but cannot be moved down
* **Similar or identical operating system:** all computers have the same operating system. But their still some newer features for higher end systems.
* **Increasing speed:** The rate of instruction execution increases in going from lower to higher family members
* **Increasing memory size:** The size of main memory increases in going from lower to higher family members
* **Increasing cost:** The cost of a system increases in going from lower to higher family members.
* **Increasing number of I/O ports:** The number of I/O ports increase more from lower to higher one.

**Question 6: What is the key distinguishing feature of a microprocessor?**

* They contain all of the components of a CPU on a single chip

**Question 7: Refer to the table 2.1**

**Address 08A**

**Right** 00100001000011111011**:** transfer contents of accumulator to memory location 08A

**Left** 00000001000011111010**:** Transfer 08A to the accumulator

**Address 08B**

**Right** 00001111000010001101: if number in the accumulator í nonnegative, take next instruction from right to half of 08B

**Left**: 00000001000011111010: Transfer 08B to the accumulator

**Address 08C**

**Right** 00100001000011111011: transfer contents of accumulator to memory location 08C

**Left** 00000010000011111010: transfer 08C to the accumulator

**Question 8: Short answer slot 2:**

01. The ENIAC was designed to help the Army’s BRL (Ballistic Research Laboratory) which was the agency responsible for developing range and trajectory tables for new weapons.

02. The first task of the ENIAC was to perform a series of complex calculations that were used to help determine the feasibility of the hydrogen bomb.

03. The first publication of the idea of the stored-program concept was in a proposal by John von Neumann for a new computer known as the EDVAC (Electronic Discrete Variable Computer)

04. The IAS computer consists of a main memory, an ALU, I/O, and a control unit.

05. The UNIVAC 1was the first successful commercial computer and was commissioned by the Bureau of the Census for the 1950 calculations.

06. A data channel is an independent I/O module with its own processor and instruction set.

07. The multiplexor is the central termination point for data channels, the CPU, and memory.

08. The term embedded system refers to the use of electronics and software within a product, designed to perform a dedicated function, as opposed to a general-purpose computer such as a laptop or desktop system.

**Question 9: Short answer slot 3:**

01. A memory address register specifies the address in memory for the next read or write.

02. A memory buffer register contains the data to be written into memory or receives the data read from memory.

03. The most common classes of interrupts are: program, timer, I/O and hardware failure.

04. A(n) timer interrupt is generated by a timer within the processor and allows the operating system to perform certain functions on a regular basis.

05. A(n) I/O interrupt is generated by an I/O controller to signal normal completion of an operation, request service from the processor, or to signal a variety of error conditions.

06. A disabled interrupt simply means that the processor can and will ignore that interrupt request signal.

07. The collection of paths connecting the various modules is called the interconnection structure.

08. A busis a communication pathway connecting two or more devices.

09. The control lines are used to control the access to and the use of the data and address lines.

10. Bus lines can be separated into two generic types: dedicated and multiplexed.

11. With asynchronous timing the occurrence of one event on a bus follows and depends on the occurrence of a previous event

**Slot04-05-CH03-TopLevelView**

**Question 1: What general categories of functions are specified by computer instructions?**

* 4 catergories: Processor-Memory data transfer, processor-I/O data transfer, data processing, control

**Question 2: List and briefly define the possible states that define an instruction execution.**

* Instruction address calculation: Determine the address of the next instruction to be executed.
* Instruction fetch: Read instruction from its memory location into the processor.
* Instruction operation decoding: Analyze instruction to determine the type of operation to be performed and operands to be used.
* Operand address calculation: If the operation involves reference to an operand in memory or available via I/O, then determine the address of the operand.
* Operand fetch: Fetch the operand from memory or read it in from I/O.
* Data operation: Perform the operation indicated in the instruction.
* Operand store: Write the result into memory or out to I/O.

**Question 3: List and briefly define two approaches to dealing with multiple interrupts.**

* Disabling interrupts: the processor has the ability to and will ignore specific interrupts. Those interrupts remain pending and will be checked after the processor has enabled interrupts.
* Interrupt service routine (ISR): priorities assigned to the different types of interrupts. ISRs with higher priorities can interrupt ones with lower priority, in which case the ISR with the lower priority is put on the stack until that ISR is completed.

**Question 4: What types of transfers must a computer’s interconnection structure (e.g., bus) support?**

* Memory to processor: The processor reads an instruction or a unit of data from memory.
* Processor to memory: The processor writes a unit of data to memory.
* I/O to processor: The processor reads data from an I/O device via an I/O module.
* Processor to I/O: The processor sends data to the I/O device.
* I/O to or from memory: For these two cases, an I/O module is allowed to exchange data directly with memory, without going through the processor, using direct memory access.

**Question 5: What is the benefit of using a multiple-bus architecture compared to a single-bus architecture?**

* The more devices attached to the bus, the greater the bus length and hence the greater the propagation delay.
* The bus may become a bottleneck as the aggregate data transfer demand approaches the capacity of the bus.

**Slot06-07-CH04-CacheMemory**

**Question 1: What are the differences among sequential access, direct access, and random access?**

* Sequential access is accessing data in a specific linear sequence.
* Direct access has the data address based on a physical location.
* With random access, any location can be selected at random, and the addressable locations in memory have a unique, physically wired-in addressing mechanism.

**Question 2: What is the general relationship among access time, memory cost, and capacity?**

* As access time becomes faster, the cost per bit increases. As memory size increases, the cost per bit is smaller. Also, with greater capacity, the access time becomes slower.

**Question 3: How does the principle of locality relate to the use of multiple memory levels?**

* Slower and less expensive memory is used in higher stages, with the most expensive being the registers in the processor as well as cache. Main memory is slower, less expensive, and is outside of the processor.

**Question 4: What are the differences among direct mapping, associative mapping, and set-associative mapping?**

* Direct mapping maps each block of main memory into only one possible cache line.
* Associative mapping permits each main memory block to be loaded into any line of the cache.
* The set-associative mapping combines both methods while decreasing disadvantages. The cache consists of a number of sets, each of which consists of a number of line.

**Question 5: For a direct-mapped cache, a main memory address is viewed as consisting of three fields.  List and define the three fields.**

* I: cache line number
* J: main memory block number
* M: the number of lines in the cache.

**Question 6: For an associative cache, a main memory address is viewed as consisting of two fields. List and define the two fields.**

* Tag and Word fields.
* The Tag field uniquely identifies a block of main memory.
* The Word is what is to be place in the block of memory.

**Question 7: Short answer slot 6:**

1. External memory consists of peripheral storage devices, such as disk and tape.

2. One byte equals 8 bits.

3. From a user’s point of view two the most important characteristics of memory are capacity and performances.

4. The three performance parameters for memory are: access time, transfer rate, and memory cycle time.

5. Associative is a random access type of memory that enables one to make a comparison of desired bit locations within a word for a specified match, and to do this for all words simultaneously, thus retrieving a word based on a portion of its contents rather than its address.

6. The transfer rate is the rate at which data can be transferred into or out of a memory unit.

7. The most commonly used physical types of memory are: semiconductor memory, magnetic surface memory (used for disk and tape), and optical and magneto-optical.

8. The three key characteristics of memory are capacity, access time, and cost.

9. External, nonvolatile memory is referred to as secondary or auxiliary memory.

10. The cache consists of blocks called lines.

11. High performance memory is a facility that allows programs to address memory from a logical point of view, without regard to the amount of main memory physically available.

12. For set-associative mapping the cache control logic interprets a memory address as three fields: Set, Word, and tag.

**Slot08-09-CH05**

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| **Question 1: What are the key properties of semiconductor memory?**  They exhibit two stable states, which can be represented by 0 or 1, they are capable of being written into to set the state, and they can be read to sense the state.  **Question 2: What are two interpretations** <giải thích> **of the term random-access memory?**  It is the memory that can be data and can be read from and written easily and rapidly  **Question 3: What is the difference between DRAM and SRAM in terms of <**về mặt**> applications?**  DRAM is used for cache memory SRAM is used for main memory  **Question 4: What is the difference between DRAM and SRAM in terms of characteristics such as speed, size, and cost?**  Speed Sram is faster,  Dram larger in size, less expensive.  **Question 5: Explain why one type of RAM is considered to be analog and the other digital**.  Dram: analog device because it stores charge and uses a threshold to determine the binary value  Sram: uses flip-flop logic gates  **Question 6: What are some applications of ROM?**  Microprogramming, system programs, function table, liberate subroutines for frequently wanted functions.  **Question 7: What are the differences among EPROM, EEPROM, and flash memory?**  EPROM is erasable programmable memory. It is read only but can be erased with ultraviolet light, allowing the memory to then be rewritten.  EEPROM is like EPROM, but can be erased with an electrical charge, can be written to anytime, without erasing contents  Flash memory is electrical erasing, faster then EPROM.  **Question 8: Explain the function of each pin in Figure 5.4b. 182 CHAPTER 5 / INTERNAL MEMORY**  VCC: power supple to chip  D1-D4: Data to be read out  WE indicates write operation  RAS Row address select  NC No connect-make even number of pin  A0-A10 Address off the wword being accessed  VSS Ground pin  CAS Column Address Select  OE Output enable-read opearation.  **Question 9: What is a parity bit?**  It is a bit in a memory compartment which is used to determine the parity of the 3 last bit  **Question 10: How is the syndrome** <hội chứng> **for the Hamming code interreted?** **How does SDRAM differ <khác> from ordinary DRAM?**  If syndrome all are 0, no error, else if it has 1, error occur in check bits without correcting, If more than 1 check bits has, the numerical value of syndrome indicates the position of data bit and then inverted for correction  SDRAM is synced to an external clock signal and operates at the full speed of the processor/memory interface, with no wait states imposed. DRAM is an asynchronous memory. |

**Slot08-09-CH06**

**Question 1: What are the advantages of using a glass substrate for a magnetic disk?** <Slide 04/ Chapter 06>

* Improvement in the uniformity of the magnetic film surface to increase disk reliability.
* A significant reduction in overall surface defects to help reduce read-write errors.
* Ability to support lower fly heights
* Better stiffness to reduce disk dynamics
* Greater ability to withstand (anti) shock and damage

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•Better stiffness (cứng) to reduce disk dynamics

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**Question 2: How are data written onto a magnetic disk?**

* Electrical pulses are sent to the write head of the drive, with the resulting magnetic patterns recorded on the surface below. The patterns are different for positive and negative currents. The write head is made of easily magnetizable material. A magnetic field is induced when the electrical pulses are sent to the write head.

**Question 3: How are data read from a** magnetic **disk?**

* The read head consists of a partially shielded magnetoresistive (MR) sensor that senses the magnetization of the medium

**Question 4: Explain the difference between a simple CAV system and a multiple zoned recording system.**

• Constant angular velocity (CAV) system: the number of bits per track is constant;  
• An increase in density is achieved with multiple zoned recording, in which the surface is divided into a number of zones, with zones further from the centre containing more bits than zones closer to the centre.

**Question 5: Define the terms track, cylinder, and sector.**

Track - On a magnetic disk, data is organized on the platter in concentric sets of rings, called tracks.  
Cylinder - On a disk with multiple platters, the set of all tracks in the same relative position on the platter is referred to as a cylinder.  
Sector - Data are transferred to and from the disk in sectors.

**Question 6: What is the typical disk sector size?** 512 byte

**Question 7: Define the terms seek time, rotational delay, access time, and transfer time.**

* Seek time is the time required to move the disk arm to the required track.
* The time it takes for the beginning of the sector to reach the head is known as rotational delay, or rotational latency.
* Once the head is in position, the read or write operation is then performed as the sector moves under the head; this is the data transfer
* portion of the operation; the time required for the transfer is the transfer time.

**Question 8: What common characteristics are shared by all RAID levels?**

* Set of physical disk drives viewed by the operating system as a single logical drive.
* Data are distributed across the physical drives of an array in a scheme known as striping
* Redundant disk capacity is used to store parity information, which guarantees data recoverability in case of a disk failure.

**Question 9: Briefly define the seven RAID levels**

RAID 0 - Non-redundant.  
RAID 1 - Mirrored, every disk has a mirror disk containing the same data.  
RAID 2 - Redundant via Hamming code; an error-correcting code is calculated across corresponding bits on each data disk, and the bits of the code are stored in the corresponding bit positions on multiple parity disks.  
RAID 3 - Bit-interleaved parity;  
RAID 4 - Block-interleaved parity;  
RAID 5 - Block-interleaved distributed parity;  
RAID 6 - Block-interleaved dual distributed parity;

**Question 10: Explain the term *striped data***

Strips, which might be physical blocks, sectors, or any other unit, are used to partition the disk. The strips are mapped to array members in a round robin fashion. A stripe is a series of logically consecutive strips that assigns exactly one strip to each array member.

**Question 11: How is redundancy achieved in a RAID system?**

It is achieved through raid 2,3,4,5,6 or mirroring to protect data raid 1.

**Question 12: In the context of RAID, what is the distinction between parallel access and independent access?**

In parallel access, all the disks are accessed at once, whereas in independent

access, the disks run independently of each other

**Question 9: Short answer:**

01. A disk is a circular platter constructed of nonmagnetic material, called the substrate, coated with a magnetizable material.

02. Data are recorded on and later retrieved from the disk via a conducting coil named the head

03. Data is organized on the platter in a concentric set of rings called tracks.

04. To increase density in a straightforward CAV system, modern hard disk systems use a technique known as multiple zone recording in which the surface is divided into a number of concentric zones.

05. In a fixed-head disk there is one read-write head per track and all of the heads are mounted on a rigid arm that extends across all tracks.

06. In a moveable-head disk there is only one read-write head mounted on an arm that can be extended or retracted to be able to be positioned above any track.

07. The floppy disk is a small, flexible platter and the least expensive type of disk.

08. Winchester heads are used in sealed drive assemblies that are almost free of contaminants and the head is actually an aerodynamic foil that rests lightly on the platter’s surface when the disk is motionless.

09. On a movable-head system, the time it takes to position the head at the track is known as seek time.

10. The time it takes for the beginning of the sector to reach the head is the rotational latency

11. The RAID is a data storage virtualization technology that combines multiple physical disk drive components into a single logical unit for the purposes of data redundancy, performance improvement, or both.

12. RAID levels 2 and 3 make use of a parallel access technique in which all member disks participate in the execution of every I/O request.

13. RAID levels 4 through 6 make use of an solite state access technique that allows separate I/O requests to be satisfied in parallel.

14. A serpentine drive is a memory device made with solid-state components that can be used as a replacement to a hard disk drive.