

IT110 Study guide By @MHazazi

1) What two advantages does switched Ethernet have over hub-based Ethernet?

Switched Ethernet has two additional advantages:

- (1) it is possible to connect nodes together in full-duplex mode, which is not possible with a single bus connection
- (2) each pair of connections can operate at the maximum bit rate of the network, since the media are unshared.

2) With the help of Flow Diagram, discuss the steps of the translation process that takes place when a user types a URL into her Web browser application.

3) What are the two fundamentally different kinds of algorithms used for encryption?

- 1- Symmetric key cryptography
- 2- public key–private key cryptography

4) What are advantages of dividing messages into packets? Describe at least three advantages.

Cost	It carries voice and video traffic across the same network, so it cuts extra costs
Reliability	It can detect if a packet is missing in transmission and request for that packet to be resent
Network Efficiency	It allows each packet to find its own path to the destination, with no dedicated connection needed

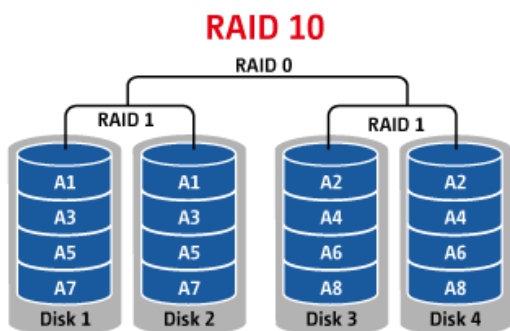
5) Distinguish between logical link control and medium access control sub-layers of data link layer.

LLC	Error correction, flow control, retransmission, packet reconstruction and IP datagram/frame conversions Numbers frames and reorders received frames to recreate the original message Rarely used
MAC	Defines procedures for access the channel and detecting errors Responsible for services such as data encoding, collision handling, synchronization, and multiplexing

6) Define LAN, MAN and WAN on the basis of network size.

LAN	within the same building or a single site
MAN	spans across an entire city or town
WAN	not restricted to a geographical location, could be confined within the bounds of a state or country

7) Show pictorial representation of RAID 10 (Stripe Across Mirrors) Disk technology.



8) What two types of memory are referred to as primary memory?

- Dynamic Random Access Memory (DRAM)
- Static Random Access Memory (SRAM)

9) List four benefits of flash memory compared to a hard drive.

1. Faster than disks but more expensive
2. Uses hot carrier injection to store bits of data
3. Slow rewrite time compared to RAM
4. Useful for nonvolatile portable computer storage

10) Why is it so important that the CPU be allowed to do other tasks while waiting for a particular I/O operation to be completed?
The CPU is operating at much higher speeds than I/O operations. If the CPU waited for I/O operations, this would be extremely inefficient

11) Once a DMA transfer has been initiated, why is it important that data being transferred not be modified during this period?
Once the DMA transfer has been initiated, the CPU is free to perform other processing. However, that the data being transferred should not be modified during this period, otherwise, transfer errors and processing errors will occur

12) Explain why it is better to have an I/O device initiate an interrupt to the CPU rather than the CPU monitor the I/O device.
Monitoring I/O devices is considered polling, which is inefficient for the CPU. By having the I/O device initiate communication to the CPU through an interrupt, it frees the CPU to perform other tasks

13) Execute all five instructions by using pipelining.

- **IF:** fetch instruction from memory
- **ID:** decode instruction and read registers
- **EX:** execute the operation or calculate address
- **MEM:** access an operand in data memory
- **WB:** write the result into a register

14) What is the minimum number of clock cycles that will be required to execute all instructions?
Five clock cycles

15) Define RISC and CISC? And List at least 3 characteristics of RISC?

CISC : Complex Instruction Set Computers. Which is a type of microprocessor design

RISC : Reduced Instruction Set Computers. Which is a type of microprocessor architecture that utilizes a small, highly-Optimized set of instructions.

RISC characteristics:

- 1- Emphasis on software
- 2- Single-clock, reduced instruction only
- 3- Low cycles per second, large code sizes
- 4- Spends more transistors on memory registers

16) What are the two situations where pipeline execution performance gets effected?

17) What are three methods for Memory performance enhancements?

- 1- Wide Path Memory Access
- 2- Memory Interleaving
- 3- Cache Memory

18) Define a bus? Differentiate between point-to-point bus and multipoint bus.

Bus	physical connection to transfer data from one location in the computer system to another
point-to-point bus	It goes from point "a" to point "b" without any stops; e.g: PCI-Express Only managed by network administrators
multipoint bus	It has multiple entrances and exits; e.g. PCI where all the cards are plugged in sharing one bus manageable by both sides

19) Define and write the role of MAR and MDR?

Memory Address Register (MAR)	hooked up with address bus "the only way" for the CPU to communicate with address bus stores the address of an instruction, or the address of data
Memory Data Register (MDR)	hooked up with data bus analog of MAR data can go in both directions: to and from memory

20) What are the four primary operations that are normally performed on registers?

- 1) Stores values from other locations (registers and memory)
- 2) Addition and subtraction
- 3) Shift or rotate data
- 4) Test contents for conditions such as zero or positive

21) Find the 9's complementary representation for the *three-digit* number -491.

22) Find the 9's complementary representation for the *four-digit* number -491.

23) Suppose you are writing a program that needs to represent a maximum 50,000 whole things (i.e. integer data type). What would be better: to use a short integer (16 bits) or long integer (64 bits)? Why?

First check that 16 bits is sufficient: $2^{16} = 65,536$ greater than 50,000, so it possible to use short integer.

24) Explain Fetch and Execute Cycle for instruction in LMC.

- **Fetch:**
 - Read program counter to identify the mailbox that contain the instruction to be executed
 - Retrieve the instruction from the mailbox
 - Decode the instruction to figure out what work to perform
- **Execute:**
 - Perform operation specified by the instruction
 - Adjust the program counter to point to the next instruction to be executed

25) Describe the advantages and disadvantages of data compression.

Advantages	1- less file size 2- less storage required 3- Fast transfer rate over a network 4- increase disk bandwidth
Disadvantages	consumes power for reversing and compressing

26) Convert this binary number 101110010_2 to Decimal | Convert this binary number 101110010_2 to Octal.

27) List the advantages of Peer-to-Peer Computing.

- All the resources and contents are shared by all the peers
- P2P is more reliable as central dependency is eliminated
- No need for full time system administration
- Lower cost to build and maintain such network

28) Define the System Architecture

The fundamental properties, and the patterns of relationships, connections, constraints, and linkages among the components and between the system and its environment.

29) What is the purpose of the standard?

Ensure universal compatibility of data formats and protocols

30) When initiating a connection, how does TCP establish a connection?

At server side, TCP sends a control packet through network layers to TCP at Clint site, Requesting a connection, this results in a brief back-and-forth series of requests and acknowledgments known as handshaking.

31) What happens when the ARP protocol is asked about an address it does not have cached?

When ARP sees an IP address that it doesn't recognize, it sends a broadcast packet with the IP address to every node on the local network. The matching node responds with its physical address; in the case of Ethernet, the physical address is the MAC address of the destination node

32) What is the difference between physical and logical topology?

Physical topology describes the actual layout of the wiring for the network.

Logical topology defines the operational relationship between the various network components

33) How many connections are required for 30 nodes to be connected in a full mesh topology?

Number of connections = $(\text{Nodes})(\text{Nodes}-1)/2$

$30*29/2 = 435$

34) Describe the difference between active matrix display and passive matrix display in a liquid crystal display (LCD) monitor. Which results in a brighter picture?

Passive Matrix Display	Active Matrix Display
One transistor per row or column ~ Low sizes	One transistor per cell ~ Higher sizes
Low contrast	Higher contrast
Poor Resolution	Higher Resolution
Poor viewing angle	Higher viewing angle
Slow Response	Faster Response
Poor Control of color	Better Control of color
Used in devices such as watches, calculator, etc.	Used in devices such as computers, etc.
Uses a grid of vertical & horizontal conductors	Based on Thin Film Transistor (TFT) Technology
Pixels are addressed one at a time by row & column matrix	Each row line is activated sequentially
Less expensive, requires less power	More expensive, requires more power

∴ **Active Matrix Display results in brighter picture.**

35) How is an arithmetic overflow error or divide by zero error interrupt different than an interrupt from the hard disk controller signaling that a data transfer has completed?

Arithmetic overflow or divide by zero errors are abnormal events and it may not be possible to complete the program in execution. In that case, the OS attempts to gracefully recover from the error through traps or exceptions.

A hard disk controller interrupting the CPU to signal that a data transfer has completed is used by the OS to resume control of the program requesting the data transfer and does not create the possibility that the system is halted.

36) What is the benefit of having fixed-length instructions over variable-length instructions?

Allow instructions to be fetched and decoded independently and in parallel

37) Summarize the performance benefits of using separate execution units for different types of instructions.

- Separate instructions with different numbers of execution steps for more efficient processing.
- Allows the parallel execution of unrelated instructions by directing each instruction to its own execution unit

38) How does the cache controller know when to use cache or go to main memory?

Every CPU request to main memory, whether data or instruction, is seen first by cache memory. A hardware cache controller checks the tags to determine if the memory location of the request is presently stored within the cache

39) What is an important disadvantage of variable length instructions?

Variable length instructions complicate pipelining, because the starting point of the new instruction is not known until the length of the previous instruction has been determined. If you extend this idea to multiple instructions, you can see the difficulty of maintaining a smooth assembly line