Computer Engineering

1. Vacuum tubes were the primary electronic component in which generation of computers?

A) First Generation

B) Second Generation

C) Third Generation

D) Fourth Generation

Answer: A) First Generation

Explanation: First-generation computers (e.g., ENIAC) were characterized by their use of thousands of vacuum tubes, which made them large, expensive, and unreliable.

2. An AI that can perform a wide variety of tasks at a human-like level of intelligence, rather than just one specific task, is known as:

A) Artificial Narrow Intelligence (ANI)

B) Artificial General Intelligence (AGI)

C) Artificial Superintelligence (ASI)

D) Reactive AI

Answer: B) Artificial General Intelligence (AGI)

Explanation: AGI, also known as strong AI, is a theoretical form of AI that would be able to understand, learn, and apply its intelligence to solve any problem, much like a human being.

3. The standard that defines the physical size and layout of a computer motherboard is called the:

A) Chipset

B) Form Factor

C) Bus Architecture

D) Socket Type

Answer: B) Form Factor

Explanation: The form factor (e.g., ATX, Micro-ATX, Mini-ITX) dictates the specifications for a motherboard's dimensions, mounting hole positions, and power connector type.

4. In a database transaction, which command is used to permanently save all changes made in the transaction?

A) `ROLLBACK`

B) `SAVEPOINT`

C) `COMMIT`

D) `SET TRANSACTION`

Answer: C) `COMMIT`

Explanation: The `COMMIT` command ends the current transaction and makes all changes visible to other users, ensuring the durability of the changes.

5. The part of the OS scheduler that selects processes from the job queue to be loaded into the ready queue in main memory is the:

A) Short-term scheduler (CPU scheduler)

B) Medium-term scheduler

C) Long-term scheduler (Job scheduler)

D) Dispatcher

Answer: C) Long-term scheduler (Job scheduler)

Explanation: The long-term scheduler controls the degree of multiprogramming by deciding which processes from secondary storage are admitted into the system for execution.

6. An MIS report that is produced only when a specific, predefined unusual situation occurs is a(n):

A) Scheduled Report

B) Ad-hoc Report

C) Exception Report

D) Detailed Report

Answer: C) Exception Report

Explanation: Exception reports are generated to alert management to conditions that fall outside of a predefined range of normalcy, such as inventory falling below a reorder point.

7. Which DOS command is used to check a disk for errors and display a status report?

A) `FORMAT`

B) `DEFRAG`

C) `CHKDSK`

D) `DISKPART`

Answer: C) `CHKDSK`

Explanation: CHKDSK (Check Disk) is a utility that verifies the file system integrity of a volume and can fix logical file system errors.

8. The type of system maintenance performed to keep a system usable in a changed or changing environment is called:

A) Corrective Maintenance

B) Adaptive Maintenance

C) Perfective Maintenance

D) Preventive Maintenance

Answer: B) Adaptive Maintenance

Explanation: Adaptive maintenance involves modifying the system to cope with changes in its external environment, such as a new operating system or hardware.

9. In Unix/Linux, the `grep -v` command is used to:

A) Perform a verbose search.

B) Search for a pattern recursively.

C) Invert the match, showing lines that do not contain the pattern.

D) Count the number of matching lines.

Answer: C) Invert the match, showing lines that do not contain the pattern.

Explanation: The `-v` option for `grep` inverts the search, making it a useful tool for filtering out unwanted lines from a file or output stream.

10. A large-scale control system used to monitor and control industrial or infrastructure processes over a wide area is a:

A) PLC (Programmable Logic Controller)

B) DCS (Distributed Control System)

C) SCADA (Supervisory Control and Data Acquisition)

D) HMI (Human-Machine Interface)

Answer: C) SCADA (Supervisory Control and Data Acquisition)

Explanation: SCADA systems are critical for managing geographically dispersed assets, such as power grids, water distribution systems, and pipelines.

11. The modern default init system in most major Linux distributions (like Ubuntu and CentOS) that manages system services is:

A) SysVinit

B) Upstart

C) Systemd

D) runit

Answer: C) Systemd

Explanation: Systemd provides aggressive parallelization capabilities, uses socket and D-Bus activation for starting services, and offers on-demand starting of daemons.

12. A logic gate that produces a high output only when its two inputs are different is a(n):

A) AND

B) OR

C) NAND

D) XOR

Answer: D) XOR

Explanation: The Exclusive OR (XOR) gate's output is true if one, and only one, of its inputs is true. It is often used in circuits that perform arithmetic operations.

13. The primary difference between TCP and UDP is that TCP is:

A) Faster and connectionless.

B) Slower but connection-oriented and reliable.

C) Used for broadcasting only.

D) Unable to handle large data packets.

Answer: B) Slower but connection-oriented and reliable.

Explanation: TCP establishes a connection and guarantees packet delivery in order, making it suitable for applications like web browsing and file transfer, whereas UDP is faster but does not guarantee delivery.

14. Kirchhoff's Current Law (KCL) states that the:

A) Sum of voltages around any closed loop is zero.

B) Algebraic sum of currents entering a node is zero.

C) Resistance of a conductor is proportional to its length.

D) Power in a circuit is the product of voltage and current.

Answer: B) Algebraic sum of currents entering a node is zero.

Explanation: KCL is based on the principle of conservation of electric charge, meaning that charge cannot accumulate at a junction.

15. In Windows NT, the set of files that contain system configuration data, such as user profiles and application settings, are known as:

A) The Boot Sector

B) The Registry Hives

C) The Master File Table

D) The Security Account Manager

Answer: B) The Registry Hives

Explanation: The Windows Registry is a hierarchical database, and its top-level keys are stored in a set of files called hives (e.g., SAM, SECURITY, SOFTWARE).

16. The data structure used by a compiler or interpreter to store information about identifiers like variables and functions is the:

A) Parse Tree

B) Symbol Table

C) Literal Table

D) Activation Record

Answer: B) Symbol Table

Explanation: A symbol table associates identifiers with their attributes, such as type, scope, and memory location, and is essential for semantic analysis and code generation.

17. In a Windows 2000 Active Directory domain, the unique, domain-wide roles that a domain controller can hold are known as:

A) GPO Roles

B) FSMO Roles

C) ADC Roles

D) PDC Roles

Answer: B) FSMO Roles

Explanation: Flexible Single Master Operation (FSMO) roles (e.g., PDC Emulator, Schema Master) are special roles assigned to specific domain controllers to prevent conflicts in a multi-master environment.

18. A virtual function in C++ that is declared with `= 0` is called a:

A) Friend function

B) Pure virtual function

C) Static function

D) Inline function

Answer: B) Pure virtual function

Explanation: A pure virtual function has no implementation in the base class. A class containing at least one pure virtual function is an abstract class.

19. The physical address of a memory location in a computer is:

A) The address generated by the CPU.

B) The address relative to the start of the program.

C) The actual address in the main memory hardware.

D) The address stored in a page table.

Answer: C) The actual address in the main memory hardware.

Explanation: The CPU generates a logical (virtual) address, which is then translated by the MMU into a physical address that corresponds to a location in RAM.

20. A 'heuristic' in the context of Artificial Intelligence is a:

A) Guaranteed optimal solution.

B) Rule of thumb or shortcut for problem-solving.

C) Type of neural network.

D) Form of logical deduction.

Answer: B) Rule of thumb or shortcut for problem-solving.

Explanation: Heuristics are used in AI to find a good-enough solution quickly when an exhaustive search is impractical. They do not guarantee optimality.

21. The speed of a processor's clock is measured in:

A) Bits per second (bps)

B) Gigabytes (GB)

C) Dots per inch (DPI)

D) Hertz (Hz)

Answer: D) Hertz (Hz)

Explanation: Clock speed, measured in cycles per second (Hertz), indicates how many instructions a CPU can process per second. Modern CPUs are measured in Gigahertz (GHz).

22. The SQL clause used to filter the results of a query based on an aggregate function is:

A) `WHERE`

B) `HAVING`

C) `GROUP BY`

D) `ORDER BY`

Answer: B) `HAVING`

Explanation: The `WHERE` clause filters rows before aggregation, while the `HAVING` clause filters groups after the `GROUP BY` clause has been applied.

23. A small piece of code within an operating system that handles a specific event, like a keypress or mouse move, is a(n):

A) System Call

B) Process

C) Interrupt Handler

D) Scheduler

Answer: C) Interrupt Handler

Explanation: An interrupt handler, or Interrupt Service Routine (ISR), is a special routine that is executed when a hardware or software interrupt occurs.

24. A prototype in system development is:

A) The final, fully functional version of the system.

B) A working model of a system built for demonstration and refinement.

C) A detailed design document.

D) The user manual for the system.

Answer: B) A working model of a system built for demonstration and refinement.

Explanation: Prototyping is an iterative development approach where a model is built to help users and developers understand the system's requirements.

25. In the Unix philosophy, a command should:

A) Be a large, monolithic program with many options.

B) Have a complex graphical user interface.

C) Do one thing and do it well.

D) Always run with superuser privileges.

Answer: C) Do one thing and do it well.

Explanation: This core principle encourages the creation of small, simple, and specialized tools that can be combined (using pipes) to perform complex tasks.

26. An industrial automation system where controllers are distributed throughout the facility and connected by a network is a:

A) SCADA System

B) PLC System

C) Distributed Control System (DCS)

D) Manufacturing Execution System (MES)

Answer: C) Distributed Control System (DCS)

Explanation: A DCS is typically used within a confined area like a single plant and provides high-speed, redundant control for continuous processes.

27. The `tar` command in Linux is used for:

A) Terminating a process.

B) Transferring files over a network.

C) Archiving files and directories.

D) Formatting a disk partition.

Answer: C) Archiving files and directories.

Explanation: `tar` (tape archiver) is a utility for creating and manipulating archive files, often used in combination with compression utilities like gzip or bzip2.

28. The number of bits processed by a computer's CPU in one go is known as the:

A) Clock Speed

B) Word Size

C) Bus Width

D) Cache Size

Answer: B) Word Size

Explanation: Word size (e.g., 32-bit or 64-bit) determines the amount of data the CPU can process at once and the maximum amount of memory it can address.

29. A 'protocol' in computer networking is a:

A) Physical hardware device.

B) Set of rules governing communication.

C) Type of network cable.

D) Software application.

Answer: B) Set of rules governing communication.

Explanation: Protocols define the format, order, and meaning of messages exchanged between communicating entities, ensuring orderly and successful data transfer.

30. The process of adding impurities to a pure semiconductor to increase its conductivity is called:

A) Doping

B) Annealing

C) Ionization

D) Diffusion

Answer: A) Doping

Explanation: Doping with donor atoms (like phosphorus) creates N-type semiconductors, while doping with acceptor atoms (like boron) creates P-type semiconductors.

31. The executable file format used in Windows is called:

A) ELF (Executable and Linkable Format)

B) Mach-O

C) a.out

D) PE (Portable Executable)

Answer: D) PE (Portable Executable)

Explanation: The PE format is used for executables, object code, and DLLs in 32-bit and 64-bit versions of Windows operating systems.

32. In C++, a reference is a(n):

A) Pointer to a memory location.

B) Alias or alternative name for an existing variable.

C) Copy of a variable.

D) Constant value.

Answer: B) Alias or alternative name for an existing variable.

Explanation: A reference must be initialized to an existing variable and cannot be changed to refer to another variable. It provides a way to pass arguments to functions by reference.

33. What is the output of the following C++ code?

```
#include <iostream>
int main() {
    int x = 10;
    int &y = x;
    y = 20;
    std::cout << x;
    return 0;
}
```

```
A) 10
B) 20
C) A memory address
D) A compile error
Answer: B) 20
Explanation: `y` is a reference to `x`. Modifying `y` directly modifies `x`, so `x` becomes 20.
```

34. A subset of Artificial Intelligence that uses multi-layered neural networks to learn from vast amounts of data is:

A) Expert Systems

B) Genetic Algorithms

C) Deep Learning

D) Case-Based Reasoning

Answer: C) Deep Learning

Explanation: Deep learning is the technology behind many recent AI advances, including advanced image recognition and natural language understanding.

35. The problem of external fragmentation in memory management can be solved by:

A) Paging

B) Compaction

C) Swapping

D) Caching

Answer: B) Compaction

Explanation: Compaction involves shuffling memory contents to place all free memory together in one large block, but it is a time-consuming process. Paging is another solution that avoids the problem altogether.

36. In MS-DOS, what is the maximum length for a filename (excluding the extension)?

A) 8 characters

B) 11 characters

C) 128 characters

D) 255 characters

Answer: A) 8 characters

Explanation: MS-DOS used the 8.3 filename convention, which limited filenames to 8 characters plus a 3-character extension.

37. The `nice` command in Unix is used to:

A) Change the ownership of a file.

B) Influence the CPU scheduling priority of a process.

C) Make a command's output more readable.

D) Stop a running process gracefully.

Answer: B) Influence the CPU scheduling priority of a process.

Explanation: A higher nice value results in a lower priority, meaning the process is "nicer" to other processes and gets less CPU time.

38. A decoder is a combinational circuit that:

A) Converts binary information from 'n' input lines to a maximum of 2^n unique output lines.

B) Selects one of many inputs to a single output.

C) Adds two binary numbers.

D) Stores a binary bit.

Answer: A) Converts binary information from 'n' input lines to a maximum of 2^n unique output lines.

Explanation: Decoders are used for tasks like memory address decoding, where a specific output line is activated based on a binary input code.

39. The Domain Name System (DNS) is used to:

A) Translate domain names into IP addresses.

B) Assign IP addresses to computers.

C) Route packets between networks.

D) Encrypt network traffic.

Answer: A) Translate domain names into IP addresses.

Explanation: DNS acts as the phonebook for the Internet, allowing users to access websites using human-readable names (e.g., [www.google.com]) instead of numeric IP addresses.

40. An `enum` in C++ is a:

A) Type of class.

B) User-defined data type consisting of a set of named integer constants.

C) Template for generic programming.

D) Preprocessor directive.

Answer: B) User-defined data type consisting of a set of named integer constants.

Explanation: Enumerations provide a way to create a collection of related constants, making the code more readable and maintainable.

41. In database design, a relationship where one record in Table A can be related to many records in Table B, and one record in Table B can be related to many in Table A, is called a:

A) One-to-One relationship

B) One-to-Many relationship

C) Many-to-Many relationship

D) Self-referencing relationship

Answer: C) Many-to-Many relationship

Explanation: This type of relationship is typically implemented using a third "junction" or "linking" table that contains foreign keys from both tables.

42. What is 'spooling' in an operating system?

A) A memory management technique.

B) The process of putting jobs for a device like a printer into a buffer.

C) A CPU scheduling algorithm.

D) A method for inter-process communication.

Answer: B) The process of putting jobs for a device like a printer into a buffer.

Explanation: Spooling (Simultaneous Peripheral Operations On-Line) allows multiple processes to send output to a device without waiting for it to be ready, improving system efficiency.

43. Which phase of the SDLC involves training users and converting to the new system?

A) Analysis

B) Design

C) Implementation

D) Maintenance

Answer: C) Implementation

Explanation: The implementation phase includes not only coding but also the critical steps of deploying the system, migrating data, and preparing the users for the transition.

44. The command `tail -f` in Linux is used to:

A) Display the first 10 lines of a file.

B) Display the last 10 lines of a file.

C) Follow a file, displaying new lines as they are added in real-time.

D) Force the deletion of a file.

Answer: C) Follow a file, displaying new lines as they are added in real-time.

Explanation: This is extremely useful for monitoring log files or other files that are actively being written to.

45. The "Bus" in a computer is a:

A) Software program.

B) Set of parallel electrical conductors that transfer data between components.

C) Type of memory.

D) Part of the operating system.

Answer: B) Set of parallel electrical conductors that transfer data between components.

Explanation: The system bus connects the major parts of a computer, such as the CPU, memory, and I/O devices.

46. What does a linker do?

A) Translates source code into machine code.

B) Combines object files into a single executable or library.

C) Loads an executable file into memory.

D) Interprets source code line by line.

Answer: B) Combines object files into a single executable or library.

Explanation: The linker resolves external references between different compiled files and links them with necessary libraries to create a final program.

47. In C++, a destructor is identified by:

A) The `~` symbol followed by the class name.

B) The `$` symbol followed by the class name.

C) The word `destructor` followed by the class name.

D) Having no return type and the same name as the class.

Answer: A) The `~` symbol followed by the class name.

Explanation: For a class named `MyClass`, the destructor would be named `~MyClass()`.

48. A 'race condition' in an operating system is a situation where:

A) Two processes are deadlocked.

B) The system is thrashing.

C) The behavior of a system depends on the unpredictable timing of uncontrollable events.

D) A process is starved of resources.

Answer: C) The behavior of a system depends on the unpredictable timing of uncontrollable events.

Explanation: This often occurs when multiple processes or threads access and manipulate shared data concurrently, and the final result depends on the particular order in which the access takes place.

49. An IPv6 address consists of how many bits?

A) 32

B) 48

C) 64

D) 128

Answer: D) 128

Explanation: IPv6 was created to address the exhaustion of IPv4 addresses and uses a 128-bit address space, allowing for a vastly larger number of unique addresses.

50. The Agile model of software development emphasizes:

A) Comprehensive documentation and rigid planning.

B) Iterative development and collaboration with the customer.

C) A strictly sequential process.

D) Post-deployment maintenance as the most important phase.

Answer: B) Iterative development and collaboration with the customer.

Explanation: Agile methodologies focus on delivering working software in small increments, adapting to changing requirements, and continuous feedback.

51. The `chmod 755 file.sh` command in Linux sets which permissions?

A) `rwxr-xr-x`

B) `rwx-wx-wx`

C) `r-xr-xr-x`

D) `rwxrwxrwx`

Answer: A) `rwxr-xr-x`

Explanation: In octal notation, 7 is `rwx` (read, write, execute), and 5 is `r-x` (read, execute). The command gives the owner full permissions, while the group and others can read and execute.

52. A 'daemon' in a Unix-like operating system is a:

A) User-level application with a GUI.

B) Hardware device driver.

C) Background process that is not under the direct control of an interactive user.

D) System-wide security policy.

Answer: C) Background process that is not under the direct control of an interactive user.

Explanation: Daemons typically perform system services, such as handling network requests (`httpd`) or scheduling jobs (`crond`).

53. The "endianness" of a computer architecture refers to:

A) The size of its word.

B) The order in which bytes are arranged in multi-byte data types.

C) The type of CPU instruction set.

D) The speed of the system bus.

Answer: B) The order in which bytes are arranged in multi-byte data types.

Explanation: Big-endian stores the most significant byte first, while little-endian stores the least significant byte first.

54. In C++, RAII (Resource Acquisition Is Initialization) is a programming idiom that:

A) Binds the life cycle of a resource to the lifetime of an object.

B) Requires all variables to be initialized when declared.

C) Is a method for runtime type identification.

D) Is a technique for optimizing recursive functions.

Answer: A) Binds the life cycle of a resource to the lifetime of an object.

Explanation: This idiom ensures that resources (like memory, files, or network sockets) are properly released by tying them to an object whose destructor is guaranteed to be called when it goes out of scope.

55. In networking, what is a 'socket'?

A) A physical port on a switch.

B) An internal endpoint for sending or receiving data within a node.

C) A type of network cable connector.

D) A hardware card for network access.

Answer: B) An internal endpoint for sending or receiving data within a node.

Explanation: A network socket is a software structure within a computer's operating system that represents one end of a connection between two programs over a network.

56. The Windows NT component responsible for enforcing security policies is the:

A) Object Manager

B) Security Reference Monitor (SRM)

C) Process Manager

D) Virtual Memory Manager

Answer: B) The Security Reference Monitor (SRM)

Explanation: The SRM is the part of the Windows Executive that runs in kernel mode and is responsible for access validation and audit-log generation.

57. An SQL `INDEX` is created in a database to:

A) Enforce referential integrity.

B) Provide a unique identifier for each row.

C) Speed up the retrieval of rows.

D) Store large binary objects.

Answer: C) Speed up the retrieval of rows.

Explanation: An index is a special lookup table that the database search engine can use to find data quickly, similar to the index in the back of a book.

58. What is a 'fork' in the context of a Unix/Linux process?

A) A system call to create a new process that is a copy of the parent process.

B) A way to merge two processes into one.

C) A tool for debugging a process.

D) A signal to terminate a process.

Answer: A) A system call to create a new process that is a copy of the parent process.

Explanation: The `fork()` system call is the primary method of process creation on Unix-like systems, creating a new child process that is an almost identical duplicate of the parent.

59. A 'smart pointer' in C++ is a:

A) Pointer that is automatically garbage collected.

B) Class that wraps a raw pointer to manage its lifetime.

C) Pointer that can point to member functions.

D) Pointer that stores type information.

Answer: B) Class that wraps a raw pointer to manage its lifetime.

Explanation: Smart pointers (like `std::unique_ptr` and `std::shared_ptr`) automate memory management and help prevent memory leaks by ensuring the pointed-to object is deleted when it is no longer needed.

60. An Uninterruptible Power Supply (UPS) for computer hardware is designed to:

A) Provide surge protection and temporary power during an outage.

B) Increase the processing speed of the computer.

C) Act as a secondary storage device.

D) Connect multiple computers to the internet.

Answer: A) Provide surge protection and temporary power during an outage.

Explanation: A UPS provides near-instantaneous protection from input power interruptions by supplying energy stored in batteries, allowing for a graceful shutdown.