Computer Engineering

1. In object-oriented programming, the ability of a method to behave differently based on the object that it is called upon is known as:

A) Inheritance

B) Encapsulation

C) Polymorphism

D) Abstraction

Answer: C) Polymorphism

Explanation: Polymorphism, meaning "many forms," allows objects of different classes to be treated as objects of a common superclass, enabling a single interface to be used for a general class of actions.

2. Which data structure is most suitable for implementing a priority queue?

A) Stack

B) Linked List

C) Heap

D) Queue

Answer: C) Heap

Explanation: A heap is a specialized tree-based data structure that satisfies the heap property, making it efficient for quickly finding the item with the highest (or lowest) priority.

3. The OSI model layer responsible for providing reliable, end-to-end communication between two devices is the:

A) Network Layer

B) Transport Layer

C) Session Layer

D) Data Link Layer

Answer: B) Transport Layer

Explanation: The Transport Layer (Layer 4) provides services such as connection-oriented communication, reliability, flow control, and multiplexing using protocols like TCP.

4. In the context of software engineering, a design pattern that provides a simplified interface to a larger body of code, such as a class library, is the:

A) Singleton Pattern

B) Factory Pattern

C) Observer Pattern

D) Facade Pattern

Answer: D) Facade Pattern

Explanation: The Facade pattern provides a unified, higher-level interface to a set of interfaces in a subsystem, making the subsystem easier to use.

5. What is the primary function of the `CONFIG.SYS` file in DOS?

A) To execute a series of commands on startup

B) To load device drivers and configure system settings

C) To define the search path for executable files

D) To format a disk

Answer: B) To load device drivers and configure system settings

Explanation: `CONFIG.SYS` is the primary configuration file for MS-DOS, used to load drivers like `HIMEM.SYS` and set system parameters before `COMMAND.COM` is processed.

6. The time complexity of the bubble sort algorithm in the worst-case scenario is:

A) $O(n \log n)$

B) $O(n)$

C) $O(n^2)$

D) $O(\log n)$

Answer: C) $O(n^2)$

Explanation: In the worst case (e.g., a reverse-sorted list), bubble sort must perform a comparison and a swap for each pair of adjacent elements on each pass, resulting in a quadratic time complexity.

7. Which of the following is a key component of a digital computer's Central Processing Unit (CPU)?

A) RAM

B) SSD

C) Control Unit

D) Motherboard

Answer: C) Control Unit

Explanation: The Control Unit (CU) is an integral part of the CPU that directs the operation of the processor by interpreting instructions and initiating the appropriate actions.

8. A field in a database table that is a primary key in another table is known as a:

A) Candidate Key

B) Super Key

C) Foreign Key

D) Alternate Key

Answer: C) Foreign Key

Explanation: A foreign key is a key used to link two tables together. It is a field (or collection of fields) in one table that refers to the Primary Key in another table.

9. In Linux, which command is used to display the amount of free and used memory in the system?

A) `df`

B) `top`

C) `free`

D) `iostat`

Answer: C) `free`

Explanation: The `free` command provides a quick summary of the system's memory usage, including total, used, free, shared, buffer, and cached memory.

10. A logic gate that produces a high output (1) if any of its inputs are high is the:

A) AND gate

B) OR gate

C) NOT gate

D) XOR gate

Answer: B) OR gate

Explanation: The OR gate implements logical disjunction. Its output is true (1) if one or more of its inputs are true.

11. What does the `this` pointer refer to in C++?

A) The memory address of the class definition

B) The memory address of the object that the member function is working on

C) The memory address of the next object to be created

D) The memory address of the static member variables

Answer: B) The memory address of the object that the member function is working on

Explanation: The `this` pointer is an implicit parameter to all member functions, containing the address of the object for which the function was invoked.

12. In System Analysis, the feasibility study that assesses whether the required technology is available and if the organization has the necessary expertise is known as:

A) Economic Feasibility

B) Operational Feasibility

C) Technical Feasibility

D) Schedule Feasibility

Answer: C) Technical Feasibility

Explanation: Technical feasibility is concerned with the hardware, software, and other technology needs of the system and whether they can be met.

13. Which process scheduling algorithm can lead to starvation for low-priority processes?

A) First-Come, First-Served (FCFS)

B) Shortest Job First (SJF)

C) Round Robin

D) Priority Scheduling

Answer: D) Priority Scheduling

Explanation: In a preemptive priority scheduling system, a continuous stream of high-priority processes can prevent a low-priority process from ever getting CPU time.

14. The phase of a compiler that combines the tokens from the source code into a parse tree is the:

A) Lexical Analysis

B) Syntax Analysis

C) Semantic Analysis

D) Code Generation

Answer: B) Syntax Analysis

Explanation: The syntax analyzer, or parser, uses the tokens generated by the lexical analyzer to create a tree-like data structure that represents the grammatical structure of the program.

15. What is the purpose of the `TRUNCATE TABLE` statement in SQL?

A) To delete all rows from a table, but not the table structure itself

B) To delete the entire table, including its structure

C) To update the data in the table

D) To add a new column to the table

Answer: A) To delete all rows from a table, but not the table structure itself

Explanation: `TRUNCATE TABLE` is a Data Definition Language (DDL) command that quickly removes all records from a table. It is generally faster than `DELETE` and does not fire triggers.

16. A semiconductor diode allows current to flow primarily in:

A) Both directions equally

B) One direction only

C) Neither direction

D) A circular path

Answer: B) One direction only

Explanation: An ideal diode has zero resistance to current flow in one direction (forward bias) and infinite resistance in the other direction (reverse bias).

17. Which Windows NT component manages the security of the system, including user logon and resource access?

A) Kernel

B) Hardware Abstraction Layer (HAL)

C) Security Account Manager (SAM)

D) Executive

Answer: C) Security Account Manager (SAM)

Explanation: The SAM is a database file in Windows NT that stores users' passwords and is used to authenticate local and remote users.

18. An Artificial Intelligence technique that mimics the process of natural selection to find optimal solutions is:

A) Neural Networks

B) Genetic Algorithms

C) Fuzzy Logic

D) Case-Based Reasoning

Answer: B) Genetic Algorithms

Explanation: Genetic algorithms are search heuristics inspired by Charles Darwin's theory of natural evolution, using processes like mutation, crossover, and selection.

19. In networking, what is a subnet mask used for?

A) To identify the physical address of a device

B) To distinguish the network portion of an IP address from the host portion

C) To encrypt data packets for secure transmission

D) To assign a domain name to an IP address

Answer: B) To distinguish the network portion of an IP address from the host portion

Explanation: By performing a bitwise AND operation between the IP address and the subnet mask, a device can determine if a destination IP is on the local network or a remote one.

20. A `constructor` in Object-Oriented Programming is a:

A) Special method used to destroy an object

B) Method that constructs the class definition

C) Special method used to initialize an object's state

D) Method for copying an object

Answer: C) Special method used to initialize an object's state

Explanation: A constructor is called automatically when an object is created and is used to set initial values for the object's attributes.

21. In a Unix-like system, what is the 'root' user?

A) The first user created on the system

B) A user with the highest level of administrative privileges

C) The user who owns the root directory (/)

D) A user account used only for remote access

Answer: B) A user with the highest level of administrative privileges

Explanation: The root user, also known as the superuser, has unrestricted access to all commands and files on the system.

22. The process of converting analog signals into a digital format is called:

A) Modulation

B) Demodulation

C) Digitization

D) Amplification

Answer: C) Digitization

Explanation: Digitization involves sampling an analog signal at regular intervals and quantizing each sample to a discrete numerical value.

23. Which Windows 2000 Server role is responsible for handling logon requests and maintaining the Active Directory database?

A) Member Server

B) Stand-alone Server

C) Domain Controller

D) Application Server

Answer: C) Domain Controller

Explanation: A Domain Controller is a server that responds to security authentication requests (logging in, checking permissions, etc.) within a Windows Server domain.

24. A collection of interconnected autonomous computers is known as a:

A) Supercomputer

B) Mainframe

C) Distributed System

D) Centralized System

Answer: C) Distributed System

Explanation: A distributed system is one in which components located on networked computers communicate and coordinate their actions by passing messages to achieve a common goal.

25. In system automation, a system that can operate without human intervention for extended periods is considered:

A) Semi-automated

B) Remotely operated

C) Fully autonomous

D) Manually controlled

Answer: C) Fully autonomous

Explanation: An autonomous system uses sensors, control systems, and artificial intelligence to make decisions and perform tasks independently.

26. Which type of software is designed to detect and remove malicious software from a computer?

A) Firewall

B) Antivirus

C) Defragmenter

D) Backup utility

Answer: B) Antivirus

Explanation: Antivirus software scans files and programs for known patterns of malware and can quarantine or delete infected files to protect the system.

27. The Third Normal Form (3NF) in database normalization is primarily concerned with eliminating:

A) Repeating groups

B) Partial dependencies

C) Transitive dependencies

D) Multi-valued dependencies

Answer: C) Transitive dependencies

Explanation: A table is in 3NF if it is in 2NF and all its attributes are functionally dependent only on the primary key, meaning there are no transitive dependencies where a non-key attribute depends on another non-key attribute.

28. The practice of breaking a large task into a number of smaller, more manageable sub-tasks is known as:

A) Recursion

B) Decomposition

C) Abstraction

D) Encapsulation

Answer: B) Decomposition

Explanation: Decomposition is a fundamental problem-solving technique in computer science and software engineering used to manage complexity.

29. Which language processor translates source code into an intermediate form, which is then executed by a virtual machine?

A) Compiler

B) Assembler

C) Interpreter

D) A combination of compiler and interpreter (e.g., Java)

Answer: D) A combination of compiler and interpreter (e.g., Java)

Explanation: Languages like Java first compile source code to an intermediate bytecode, which is platform-independent. This bytecode is then interpreted by the Java Virtual Machine (JVM) on the target machine.

30. In digital electronics, a multiplexer (MUX) is a device that:

A) Selects one of several analog or digital input signals and forwards it to a single output line

B) Performs arithmetic operations on binary data

C) Stores a single bit of data

D) Converts a parallel data signal to a serial one

Answer: A) Selects one of several analog or digital input signals and forwards it to a single output line

Explanation: A multiplexer acts like a digitally controlled switch, using a set of select lines to determine which input is routed to the output.

31. A decision-making tool in MIS that uses a tree-like model of decisions and their possible consequences is a:

A) Spreadsheet

B) Gantt Chart

C) Decision Tree

D) Flowchart

Answer: C) Decision Tree

Explanation: A decision tree is used to map out the possible outcomes of a series of related choices, helping to identify the most effective strategy to reach a goal.

32. What is the Big O notation for the best-case time complexity of the quicksort algorithm?

A) $O(n^2)$

B) $O(n \log n)$

C) $O(n)$

D) $O(\log n)$

Answer: B) $O(n \log n)$

Explanation: The best and average case for quicksort occurs when the pivot element consistently divides the array into two roughly equal halves, leading to a logarithmic number of partitions.

33. Which command in Linux is used to create a hard link to a file?

A) `ln`

B) `link`

C) `hl`

D) `cp -l`

Answer: A) `ln`

Explanation: The `ln` command is used to create links between files. By default, it creates hard links. The `ln -s` option is used to create symbolic (soft) links.

34. A class in C++ from which other classes are derived is called a:

A) Child Class

B) Derived Class

C) Subclass

D) Base Class

Answer: D) Base Class

Explanation: The base class (or parent class) provides the initial attributes and methods that are inherited by the derived classes.

35. The process by which an operating system's kernel allows multiple threads to exist within the context of a single process is known as:

A) Multiprogramming

B) Multitasking

C) Multithreading

D) Multiprocessing

Answer: C) Multithreading

Explanation: Multithreading enables a process to be divided into smaller, independent threads of execution that can run concurrently, sharing the process's resources.

36. An electronic component with two terminals that exhibits electrical resistance as a circuit element is a:

A) Capacitor

B) Inductor

C) Diode

D) Resistor

Answer: D) Resistor

Explanation: A resistor is a passive electrical component used to implement electrical resistance, reduce current flow, and divide voltages within a circuit.

37. The DOS command `FDISK` is used for what purpose?

A) To format a floppy disk

B) To fix errors on a disk

C) To partition a hard disk drive

D) To defragment a hard disk

Answer: C) To partition a hard disk drive

Explanation: `FDISK` is a command-line utility that allows users to create, delete, and manage the partitions on a hard drive before formatting them.

38. In networking, DNS (Domain Name System) is used to:

A) Assign IP addresses to devices on a network

B) Translate human-readable domain names into machine-readable IP addresses

C) Secure communication between a web browser and a server

D) Route packets between different networks

Answer: B) Translate human-readable domain names into machine-readable IP addresses

Explanation: DNS serves as the phonebook of the Internet. When you type a domain name like 'www.google.com', your browser uses DNS to find the corresponding IP address to connect to the server.

39. The software development model that emphasizes flexibility and collaboration through short, iterative cycles is the:

A) Waterfall Model

B) V-Model

C) Agile Model

D) Spiral Model

Answer: C) Agile Model

Explanation: Agile methodologies, such as Scrum and Kanban, prioritize responding to change over following a rigid plan, focusing on delivering working software in small, regular increments.

40. A computer's BIOS (Basic Input/Output System) is stored in:

A) RAM

B) The hard drive

C) A ROM chip on the motherboard

D) The CPU cache

Answer: C) A ROM chip on the motherboard

Explanation: The BIOS is firmware stored in a non-volatile Read-Only Memory (ROM) chip, ensuring that it is available as soon as the computer is turned on to initialize the hardware.

41. In database management, the overall description of the database is called the:

A) Schema

B) Instance

C) View

D) Model

Answer: A) Schema

Explanation: The database schema is the "blueprint" of the database which outlines the structure, data types, and the relationships among the tables in the database.

42. The process of the operating system loading into memory when a computer is turned on is known as:

A) Compiling

B) Booting

C) Linking

D) Executing

Answer: B) Booting

Explanation: The boot process involves loading the operating system kernel from secondary storage (like a hard drive) into the main memory (RAM) so it can start running.

43. Which of the following is an example of an expert system?

A) A chess-playing program like Deep Blue

B) A medical diagnosis system like MYCIN

C) A search engine like Google

D) A speech recognition system like Siri

Answer: B) A medical diagnosis system like MYCIN

Explanation: MYCIN was an early expert system that used an inference engine and a knowledge base of about 600 rules to identify bacteria causing severe infections and recommend antibiotics.

44. In a Unix shell, what is the purpose of the `>` character in a command?

A) To pipe the output of one command to another

B) To execute a command in the background

C) To redirect the standard output of a command to a file

D) To read input for a command from a file

Answer: C) To redirect the standard output of a command to a file

Explanation: The `>` operator is the output redirection operator. For example, `ls > file.txt` will write the output of the `ls` command into `file.txt`, overwriting the file if it exists.

45. The memory address generated by the CPU is referred to as the:

A) Physical Address

B) Logical Address

C) MAC Address

D) Port Address

Answer: B) Logical Address

Explanation: The CPU generates a logical (or virtual) address, which is then translated by the Memory Management Unit (MMU) into a physical address in main memory.

46. In C++, a class member that can be accessed without creating an instance of the class is called a:

A) Virtual member

B) Friend member

C) Static member

D) Constant member

Answer: C) Static member

Explanation: Static members belong to the class itself rather than to any specific object instance. They are shared among all objects of the class.

47. What does a "bus" in computer hardware refer to?

A) A type of memory storage

B) A communication system that transfers data between components inside a computer

C) A software program that manages peripherals

D) The power supply unit

Answer: B) A communication system that transfers data between components inside a computer

Explanation: A bus is a set of parallel electrical conductors that carry data, address, and control signals between the CPU, memory, and other peripherals.

48. A software bug that occurs when two or more processes are trying to access the same shared resource at the same time and the final result depends on the timing of their execution is a:

A) Deadlock

B) Race Condition

C) Starvation

D) Livelock

Answer: B) Race Condition

Explanation: A race condition is a flaw in a concurrent system where the outcome of an operation is unexpectedly dependent on the sequence or timing of other events.

4-9. The practice of designing software in self-contained, interchangeable components is known as:

A) Structured Programming

B) Object-Oriented Programming

C) Modular Programming

D) Functional Programming

Answer: C) Modular Programming

Explanation: Modular programming emphasizes separating the functionality of a program into independent, interchangeable modules, such that each contains everything necessary to execute only one aspect of the desired functionality.

50. In digital logic, what is the function of a flip-flop?

A) To amplify a digital signal

B) To store a single bit of binary data

C) To perform logical operations like AND or OR

D) To select between multiple input signals

Answer: B) To store a single bit of binary data

Explanation: A flip-flop is a bistable multivibrator circuit. It has two stable states and can be used to store state information, making it a fundamental building block of sequential logic and computer memory.

51. Which network protocol is used to securely connect to a remote computer over an unsecured network?

A) FTP (File Transfer Protocol)

B) Telnet

C) SSH (Secure Shell)

D) HTTP (Hypertext Transfer Protocol)

Answer: C) SSH (Secure Shell)

Explanation: SSH provides a secure channel over an unsecured network in a client-server architecture, encrypting the entire session to protect against eavesdropping and other attacks. Telnet, by contrast, sends data in plaintext.

52. In data analysis, the process of cleaning and transforming raw data prior to processing and analysis is called:

A) Data Mining

B) Data Visualization

C) Data Wrangling

D) Data Modeling

Answer: C) Data Wrangling

Explanation: Data wrangling (or data munging) is the process of transforming and mapping data from one "raw" data form into another format with the intent of making it more appropriate and valuable for a variety of downstream purposes such as analytics.

53. A language processor that is responsible for binding library files to an object file to create an executable is the:

A) Preprocessor

B) Compiler

C) Loader

D) Linker

Answer: D) Linker

Explanation: The linker is a system program that takes one or more object files generated by a compiler and combines them into a single executable file, library file, or another object file.

54. The principle in object-oriented programming of hiding the implementation details of an object from the outside world is:

A) Inheritance

B) Polymorphism

C) Abstraction

D) Encapsulation

Answer: C) Abstraction

Explanation: Abstraction means displaying only essential information and hiding the details. It involves showing only the relevant attributes and methods of an object to the user.

55. In a relational database, what is the purpose of an index?

A) To enforce data integrity constraints

B) To provide a logical view of the data

C) To speed up the retrieval of rows from a table

D) To store a backup of the database

Answer: C) To speed up the retrieval of rows from a table

Explanation: An index is a special lookup table that the database search engine can use to speed up data retrieval. It works like the index in the back of a book.

56. Which type of electronic circuit converts a continuous range of input voltage levels into a discrete set of digital output codes?

A) Digital-to-Analog Converter (DAC)

B) Analog-to-Digital Converter (ADC)

C) Rectifier

D) Amplifier

Answer: B) Analog-to-Digital Converter (ADC)

Explanation: An ADC is a fundamental component in digital systems that interact with the real world, as it allows a microprocessor to read and process analog signals from sensors.

57. The main file system used by modern versions of Linux is:

A) FAT32

B) NTFS

C) HFS+

D) ext4

Answer: D) ext4

Explanation: The ext4 (fourth extended filesystem) is the default filesystem for most modern Linux distributions, offering robustness, performance, and features like journaling.

58. What is the role of a Gateway in a computer network?

A) It connects devices within the same local network

B) It connects two different networks that use different protocols

C) It amplifies the signal to extend the network range

D) It filters traffic based on MAC addresses

Answer: B) It connects two different networks that use different protocols

Explanation: A gateway acts as a node that connects two networks with different transmission protocols together. It translates one protocol to another.

59. A software development lifecycle model where the project is divided into a series of mini-projects, each iterating through the full development process, is the:

A) Waterfall Model

B) Incremental Model

C) RAD Model

D) Big Bang Model

Answer: B) Incremental Model

Explanation: In an incremental model, the whole requirement is divided into various builds. Multiple development cycles take place, making the life cycle a "multi-waterfall" cycle.

60. In Windows 2000 Server, what is the primary purpose of Group Policy?

A) To assign IP addresses to clients

B) To manage user and computer settings across a network

C) To monitor network performance

D) To back up files on the server

Answer: B) To manage user and computer settings across a network

Explanation: Group Policy is a feature that provides centralized management and configuration of operating systems, applications, and users' settings in an Active Directory environment.