--Question Starting--  
36. In a distributed database system, a deadlock situation occurred involving four transactions across different nodes. Each transaction was awaiting a resource held by another, forming a circular wait. The system architect plans to implement a solution that involves preemption of resources, transaction rollbacks, and a priority-based resource allocation mechanism.   
Which of the following methods would be least effective in addressing the deadlock situation described?  
(1) Using a timeout mechanism to detect deadlocks and roll back transactions based on priorities.  
(2) Implementing a deadlock avoidance algorithm, such as Banker's Algorithm, which preempts and reallocates resources dynamically.  
(3) Enabling a deadlock detection system that periodically checks for cycles in the resource allocation graph and resolves them by transaction rollback.  
(4) Applying a strict two-phase locking (2PL) protocol which might intensify the deadlock situation by increasing the number of lock conversions.  
Answer Key: 2  
Solution:  
• (Correct): A timeout mechanism is a simple yet effective way to break deadlocks by determining which transactions to rollback based on their priorities and how long they have been waiting.  
• (Incorrect): While the Banker's Algorithm is effective in preventing deadlocks by ensuring that resource allocation never enters an unsafe state, it might not be suitable in a distributed environment where resource states can change dynamically and unpredictably.  
• (Correct): Deadlock detection systems that identify cycles in the resource allocation graph can effectively resolve deadlocks by selectively rolling back transactions involved in the deadlock.  
• (Correct): Two-phase locking can cause more deadlocks as it requires transactions to hold on to all locks acquired in the first phase until all operations are completed, thereby increasing the risk of circular waits.  
Hence, Option (2) is the right answer.  
  
--Question Starting--  
37. A network administrator is configuring a corporate network that includes various devices and services across multiple subnets. The configuration involves assigning IP addresses, setting up DNS for name resolution, and implementing VLANs for departmental segmentation. The administrator must also ensure communication across different network layers and between heterogeneous network protocols.  
Which aspect of the network setup does not directly contribute to inter-layer communication and protocol interoperability?  
(1) Assigning IP addresses to ensure proper logical addressing within the network.  
(2) Utilizing the OSI model to guide the setup and integration of network protocols.  
(3) Implementing VLANs to segment the network according to departmental needs.  
(4) Configuring routers to perform network address translation between subnets.  
Answer Key: 2  
Solution:  
• (Correct): IP addresses are crucial for logical addressing and routing across the network, facilitating layer 3 (Network Layer) activities.  
• (Incorrect): While the OSI model provides a theoretical framework for understanding and implementing layered network architectures, it does not directly involve the configuration tasks needed for protocol interoperability or actual data flow.  
• (Correct): VLANs are primarily used for segmenting a physical network into multiple logical networks at layer 2 (Data Link Layer), which affects intra-layer communication but not inter-layer communication.  
• (Correct): Routers, especially when configured for network address translation, play a critical role in managing traffic between different subnets and facilitating layer 3 communications.  
Hence, Option (2) is the right answer.  
  
--Question Starting--  
38. A computer engineering student is designing a microprocessor as part of their thesis. The design includes specifying microoperations for arithmetic calculations, memory access, and control signal generation. The student plans to implement complex instruction set computing (CISC) architecture, which includes a variety of specialized instructions.  
Which aspect of microprocessor design is least related to defining and implementing microoperations for arithmetic and control?  
(1) Choosing register transfer language (RTL) to specify the exact sequence of control signals for each operation.  
(2) Deciding on the bus architecture to facilitate data transfers between registers and memory units.  
(3) Implementing a hardware multiplier to speed up arithmetic operations involving multiplication.  
(4) Selecting a suitable set of machine instructions that allow for versatile programming and application development.  
Answer Key: 1  
Solution:  
• (Incorrect): Register transfer language is directly related to microoperations as it defines the precise control and timing of data transfers and operations within the CPU.  
• (Correct): While the bus architecture is crucial for data movement across different parts of the microprocessor, it does not directly influence the specific microoperations performed during arithmetic and control tasks.  
• (Correct): A hardware multiplier is an essential component for efficient arithmetic microoperations, especially in CISC architectures where multiple arithmetic tasks need to be accelerated.  
• (Correct): The choice of machine instruction set impacts the overall flexibility and capability of the processor, influencing how effectively it can perform a wide range of tasks, including microoperations.  
Hence, Option (2) is the right answer.  
  
--Question Starting--  
39. In a computer architecture course, students are tasked with developing an assembler that translates assembly language programs into machine code. The project includes handling symbolic labels, translating mnemonics to opcodes, and managing storage directives. The students also need to implement error detection for syntax and semantic errors in the assembly programs.  
Which of the following tasks is least associated with the core functions of an assembler?  
(1) Translating assembly language mnemonics into corresponding machine code opcodes.  
(2) Resolving addresses for symbolic labels used in the assembly program.  
(3) Generating a detailed listing file that includes the original assembly code and corresponding machine code.  
(4) Creating a user interface for the assembler program to facilitate code editing and debugging.  
Answer Key: 1  
Solution:  
• (Incorrect): Translating mnemonics to opcodes is a fundamental task of an assembler, directly involved in the conversion from assembly to machine language.  
• (Correct): Resolving symbolic labels to their respective addresses is crucial for correct code generation and is a primary function of an assembler.  
• (Correct): Generating a listing file is helpful for debugging and verifying the assembly to machine code translation, thus integral to the assembler’s functionality.  
• (Correct): While a user interface enhances the usability of the assembler, it is not directly related to the core computational functions of translating assembly code or handling storage directives.  
Hence, Option (1) is the right answer.  
  
--Question Starting--  
40. During a computer science seminar, a discussion arises about the application of artificial intelligence in strategic game playing. The conversation focuses on advanced algorithms used in games like chess and Go, particularly those involving heuristic evaluations and decision trees. A new algorithm is proposed that combines deep learning with traditional min-max strategies to enhance predictive accuracy and speed.  
Which of the following considerations is least relevant to improving the performance of AI algorithms in game playing?  
(1) Enhancing the heuristic function to provide deeper analysis of possible moves.  
(2) Optimizing the search algorithm to prune irrelevant branches and reduce computational load.  
(3) Incorporating real-time player feedback to adjust AI strategies during the game.  
(4) Implementing alpha-beta cutoff techniques to minimize the number of nodes evaluated in the search tree.  
Answer Key: 4  
Solution:  
• (Correct): Improving the heuristic function directly impacts the AI’s ability to evaluate and prioritize moves, essential for strategic depth.  
• (Correct): Optimizing search algorithms, such as implementing effective pruning strategies, is crucial for managing the complexity and enhancing the speed of AI decision-making processes.  
• (Incorrect): While real-time player feedback can be useful in interactive applications, it is generally irrelevant in the context of AI algorithms designed for autonomous strategic game playing, where decisions are precomputed based on possible game states rather than player input.  
• (Correct): Alpha-beta pruning is a well-known technique in game theory that significantly reduces the search space, thereby improving the efficiency of the AI’s decision-making process.  
Hence, Option (3) is the right answer.