--Question Starting--  
29. Consider a social networking platform that has implemented a variety of NoSQL storage systems to manage different types of data such as user profiles, connections, posts, and messages. Given the diverse nature of queries, ranging from simple lookups to complex aggregations and graph traversals, which of the following approaches would be least effective in optimizing query performance across these varied data models?  
(1) Implementing a polyglot persistence architecture that uses the most appropriate data model for each type of query.  
(2) Using a single NoSQL system that supports secondary indexing to handle all types of data uniformly.  
(3) Applying denormalization and embedding documents where possible to reduce the need for joins.  
(4) Leveraging data partitioning and sharding techniques to distribute queries and data across multiple servers.  
Answer Key: 2  
Solution:  
• (Correct): Polyglot persistence tailors the database technology to the specific needs of each data type and query, optimizing performance.  
• (Incorrect): While secondary indexing helps in improving the performance of some queries, relying solely on one type of NoSQL system for diverse data types and queries can lead to suboptimal performance, as not all systems are equally efficient for all kinds of operations.  
• (Correct): Denormalization and embedding can significantly enhance read performance by eliminating the need for complex joins, which are costly in NoSQL systems.  
• (Correct): Sharding and partitioning effectively distribute data and workload across several nodes, thereby improving query responsiveness and scalability.  
Hence, Option (2) is the right answer.  
  
--Question Starting--  
27. An AI research team is developing a robot that can adapt its strategies based on environmental changes and previous outcomes using a genetic algorithm. The researchers are debating over the best way to represent the robot's strategy choices in the genetic algorithm. Which of the following encoding strategies is most likely to hinder the genetic algorithm's ability to effectively explore a diverse range of solutions?  
(1) Binary encoding, which simplifies crossover and mutation operations.  
(2) Permutation encoding, suitable for ordering and sequencing problems.  
(3) Direct encoding of strategy parameters as floating-point numbers.  
(4) Hierarchical encoding that rigidly defines parent-child relationships in strategy components.  
Answer Key: 4  
Solution:  
• (Correct): Binary encoding is versatile and makes genetic operations straightforward, often enhancing the GA's exploration capabilities.  
• (Correct): Permutation encoding is particularly effective in problems where the order matters, such as routing or scheduling, allowing the GA to explore permutations efficiently.  
• (Correct): Direct encoding allows for a direct manipulation of parameters, providing a fine-grained control over the solution space, beneficial for continuous optimization.  
• (Incorrect): Hierarchical encoding can impose constraints on how components interact and evolve, potentially limiting the genetic algorithm’s ability to generate diverse and innovative solutions across generations.  
Hence, Option (4) is the right answer.  
  
--Question Starting--  
36. During the design phase of a new cloud-based application, a software architect is evaluating different cloud services to ensure efficient resource management, scalability, and compliance with the service level agreement (SLA). Which of the following scenarios would likely pose the greatest challenge in meeting the SLA requirements?  
(1) Utilizing a public PaaS solution for rapid development and deployment.  
(2) Employing a private IaaS cloud to maintain control over physical hardware resources.  
(3) Outsourcing database storage to a cloud service with elastic scalability.  
(4) Relying solely on virtual servers for dynamic resource allocation and scaling.  
Answer Key: 4  
Solution:  
• (Correct): Public PaaS provides managed services that can speed up development and handle many operational aspects, aiding in SLA compliance.  
• (Correct): Private IaaS gives the organization control over physical resources, potentially enhancing security and performance consistency, aligning with SLA specifics.  
• (Correct): Cloud databases that offer elastic scalability can quickly adjust resources to meet varying loads, thus supporting SLA adherence.  
• (Incorrect): Virtual servers offer flexibility, but relying solely on them without integrating other scalability and redundancy measures such as load balancing or multi-region deployments may fall short in meeting SLA requirements during peak loads or failover scenarios.  
Hence, Option (4) is the right answer.  
  
--Question Starting--  
34. A logistics company uses a centralized planning system to manage its supply chain. The system incorporates various planning techniques to optimize route schedules and inventory levels. Considering the complexity of handling multiple warehouses and transportation modes, which planning model might introduce inefficiencies in adapting to sudden changes in supply chain demands?  
(1) Linear planning focused on cost minimization through straightforward linear relationships.  
(2) Goal stack planning, which organizes tasks in a LIFO manner to address goal conflicts.  
(3) Hierarchical planning, which decomposes problems into subproblems and solves them sequentially.  
(4) Partial order planning that allows for flexibility in the sequence of actions.  
Answer Key: 1  
Solution:  
• (Incorrect): Linear planning is efficient for problems with direct, predictable relationships but may not adapt well to dynamic environments with complex, non-linear interactions typical in a multi-modal supply chain.  
• (Correct): Goal stack planning effectively resolves goal conflicts by prioritizing tasks, useful in dynamic environments.  
• (Correct): Hierarchical planning helps in managing complexity by breaking down the supply chain into manageable segments, though it may sometimes be slow to adapt to sudden changes.  
• (Correct): Partial order planning offers flexibility by not enforcing a strict order of operations, suitable for dynamic adjustments.  
Hence, Option (1) is the right answer.  
  
--Question Starting--  
33. In the context of implementing virtual machines within a corporate data center, an IT specialist is considering the impact of different virtualization techniques on system performance and management. Which virtualization approach might complicate the management and monitoring of virtual machines due to its inherent complexity and overhead?  
(1) Full virtualization that completely simulates hardware, allowing unmodified guest OS to run.  
(2) Paravirtualization where the guest OS is aware of the virtualization and is optimized accordingly.  
(3) OS-level virtualization, which allows for multiple isolated user-space instances.  
(4) Hardware-assisted virtualization that leverages CPU features to enhance performance.  
Answer Key: 4  
Solution:  
• (Correct): Full virtualization provides a high level of isolation and compatibility, but may introduce performance overhead due to complete emulation of hardware.  
• (Correct): Paravirtualization reduces overhead by allowing the guest OS to interact with the host, simplifying management.  
• (Correct): OS-level virtualization offers efficient resource use and simpler management by avoiding full emulation of hardware.  
• (Incorrect): Hardware-assisted virtualization improves performance by utilizing specific CPU extensions; however, it can introduce complexity in setup and monitoring, especially when integrating with existing systems without these capabilities.  
Hence, Option (4) is the right answer.