--Question Starting--  
1. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R).  
Assertion (A): The worst-case time complexity of an optimized merge sort algorithm is O(n log n).  
Reason (R): Merge sort is a divide-and-conquer algorithm that divides the input array into two halves, sorts them separately, and then merges them in a linear traversal, which ensures minimum time complexity for sorting operations.  
In light of the above statements, choose the most appropriate answer from the options below:  
(1) Both Assertion and Reason are correct, and Reason is the correct explanation of Assertion.  
(2) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.  
(3) Assertion is correct, but Reason is incorrect.  
(4) Assertion is incorrect, but Reason is correct.  
Answer Key: 3  
Solution:  
• (Assertion is Correct): The worst-case time complexity for merge sort, even when optimized, remains O(n log n) due to the nature of its divide-and-conquer approach.  
• (Reason is Incorrect): Although the description of merge sort is correct, the claim that this ensures minimum time complexity for sorting operations is not accurate, as "minimum" implies it is the best possible among all sorting algorithms, which isn't necessarily true.  
Hence, Option (3) is the right answer.  
  
--Question Starting--  
2. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R).  
Assertion (A): In a distributed system, achieving consensus among multiple nodes often requires complex algorithms.  
Reason (R): Consensus in distributed systems is necessary to ensure that all nodes agree on a single data value, which is critical for maintaining the integrity of operations across the system.  
In light of the above statements, choose the most appropriate answer from the options below:  
(1) Both Assertion and Reason are correct, and Reason is the correct explanation of Assertion.  
(2) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.  
(3) Assertion is correct, but Reason is incorrect.  
(4) Assertion is incorrect, but Reason is correct.  
Answer Key: 2  
Solution:  
• (Assertion is Correct): Consensus algorithms, such as Paxos or Raft, are indeed complex due to the need to ensure reliability and agreement despite potential node failures or network issues.  
• (Reason is Correct): The purpose of achieving consensus is crucial for data consistency and integrity, particularly in operations that involve multiple nodes.  
Hence, Option (2) is the right answer.  
  
--Question Starting--  
3. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R).  
Assertion (A): In software design, high cohesion within a module enhances its maintainability.  
Reason (R): Cohesion refers to the extent to which the tasks performed by a single module are functionally related, which simplifies understanding and modification.  
In light of the above statements, choose the most appropriate answer from the options below:  
(1) Both Assertion and Reason are correct, and Reason is the correct explanation of Assertion.  
(2) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.  
(3) Assertion is correct, but Reason is incorrect.  
(4) Assertion is incorrect, but Reason is correct.  
Answer Key: 1  
Solution:  
• (Assertion is Correct): High cohesion in a module means that the module performs a single task or a group of related tasks, making it easier to maintain and modify.  
• (Reason is Correct): The definition of cohesion accurately explains why high cohesion contributes to better maintainability, as it focuses the module's functionality, reducing complexity.  
Hence, Option (1) is the right answer.  
  
--Question Starting--  
4. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R).  
Assertion (A): The problem of determining if there exists a subset of numbers that sums up to a given number is NP-complete.  
Reason (R): NP-complete problems are those for which no polynomial-time algorithm is known and for which a solution can be verified quickly.  
In light of the above statements, choose the most appropriate answer from the options below:  
(1) Both Assertion and Reason are correct, and Reason is the correct explanation of Assertion.  
(2) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.  
(3) Assertion is correct, but Reason is incorrect.  
(4) Assertion is incorrect, but Reason is correct.  
Answer Key: 4  
Solution:  
• (Assertion is Incorrect): While the subset sum problem is indeed NP-complete, this assertion inaccurately generalizes NP-complete problems as necessarily lacking polynomial-time solutions, which is unproven (P vs NP problem).  
• (Reason is Correct): The definition of NP-complete problems, including the aspect of solutions being verifiable in polynomial time, is accurate.  
Hence, Option (4) is the right answer.  
  
--Question Starting--  
5. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R).  
Assertion (A): SQL injection is a code injection technique that exploits a security vulnerability occurring in the database layer of an application.  
Reason (R): The vulnerability is exploited by manipulating SQL commands through the input data from the client to the application.  
In light of the above statements, choose the most appropriate answer from the options below:  
(1) Both Assertion and Reason are correct, and Reason is the correct explanation of Assertion.  
(2) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.  
(3) Assertion is correct, but Reason is incorrect.  
(4) Assertion is incorrect, but Reason is correct.  
Answer Key: 4  
Solution:  
• (Assertion is Incorrect): The definition of SQL injection is partially correct but fails to specify that it not only occurs in the database layer but can affect any part where SQL commands are executed.  
• (Reason is Correct): Manipulating SQL commands through input data accurately describes how attackers exploit vulnerabilities to execute malicious SQL.  
Hence, Option (4) is the right answer.