--Question Starting--
1. Consider the following two statements related to the analysis and performance of algorithms:
Statement I: The worst-case time complexity of QuickSort is O(n^2), but with proper pivot choice, it can be optimized to O(n log n) on average.
Statement II: The recurrence relation T(n) = 2T(n/2) + n represents the time complexity of the MergeSort algorithm, which consistently performs at O(n log n) in the worst case.
In light of the above statements, choose the correct answer from the options given below:
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct
Answer Key: 3
Solution:
? Statement I (Correct): QuickSort's worst-case time complexity is indeed O(n^2), typically occurring when the smallest or largest element is always chosen as the pivot. However, with a randomized pivot, the average time complexity becomes O(n log n).
? Statement II (Incorrect): The given recurrence relation T(n) = 2T(n/2) + n indeed describes a divide and conquer algorithm like MergeSort, but the description of its worst-case performance as O(n log n) applies universally to MergeSort due to its structure and not specifically to this recurrence without further context.
Hence, Option (3) is the right answer.

--Question Starting--
2. Consider the following statements regarding software requirements:
Statement I: Functional requirements define the fundamental actions that must occur in the system in order for it to behave correctly.
Statement II: Non-functional requirements are not crucial for the system operation but define system attributes such as performance, usability, and reliability.
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct
Answer Key: 2
Solution:
? Statement I (Correct): Functional requirements indeed specify what the system should do and include detailed behaviors or functions.
? Statement II (Incorrect): Non-functional requirements are crucial and often impact the system's operation significantly. They define how the system performs certain operations, not just peripheral attributes. They are essential for ensuring the system meets its intended quality standards and user expectations.
Hence, Option (2) is the right answer.

--Question Starting--
3. Analyze the following statements about database systems:
Statement I: Data independence refers to the capacity to change the schema at one level of a database system without having to alter the schema at the next higher level.
Statement II: The three-schema architecture involves only two levels of abstraction to separate user views and the physical storage.
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct
Answer Key: 2
Solution:
? Statement I (Correct): Data independence is a key feature of database architecture, allowing changes in the

schema at one level (physical or logical) without affecting other levels, thereby providing flexibility and ease of maintenance.

? Statement II (Incorrect): The three-schema architecture actually includes three levels of abstraction: the internal level (physical storage), the conceptual level (logical structure), and the external level (user views). This structure helps achieve data independence and provides a clear separation between how data is stored and how it is perceived by users.

Hence, Option (2) is the right answer.