Bitnine Internship Question No.2 Backend

The three approaches utilized for solving the question were the following:-

- Recursive
- Iterative
- Dynamic Programming

Methodology	Pros	Cons
Recursive	● Simple to understand and implement. ● Intuitive for solving recurrence relations.	● Time complexity $O(2^n)$. ● Space complexity O(n).
Iterative	● Linear time complexity O(n). ● Constant space complexity O(1). ● Relatively easy to understand and implement.	● Less intuitive than the recursive solution.
Dynamic Programming	● Linear time complexity O(n). ● Constant space complexity O(1). ● Can be generalized for solving other recurrence relations.	● Less intuitive than the recursive solution . ● Requires knowledge of dynamic programming principles.

Analysis:-

The iterative and dynamic programming solutions are the normal go-to solutions due to their faster time complexity and space complexity. The choice between iterative and dynamic programming purely boils down to ease of implementation and clarity of code.

The iterative approach may be more simple and easier to understand since it does not have a data structure and a few variables, however, the dynamic programming approach may be more modular and easier to extend/generalize. In short, the coding style, personal preference and constraints/requirements of the problem would need to be considered.

However, it should be noted that the recursive approach might be a good fit for smaller inputs because it is more intuitive and the time complexity would not be a concern for small values of n up to around 20. In fact, the recursive solution may be faster than both iterative and dynamic programming approaches for lower values of n.