ABIN Assignment-4: Question- 3

Instructions:

1. This is an optional question, ONLY for those groups who have not submitted "Q3 of Assignment 4"
2. **Deadline: Monday, 13th November, 2023**
3. Rest all the instructions of Assignment 4 are applicable.

Q3: Given a sequence of amino acids that form a protein, find the most likely path of hidden states that could generate this sequence.
Assume you are given a hidden Markov model (HMM) with known transition probabilities between states, emission probabilities of amino acids in each state, and initial state probabilities.
You need to implement the Viterbi algorithm, which will compute the most likely sequence of states (secondary structure elements like alpha-helix, beta-sheet, or coil) given the sequence of amino acids (observations).

Input:
- A string `sequence` representing the sequence of amino acids (e.g., "AGTY...").
- A list `states` containing the possible states of the protein structure.
- A dictionary `start_probability` with the probability of the sequence starting from each state.
- A dictionary `transition_probability` where each key is a state, and the value is another dictionary with the probabilities of transitioning to other states.
- A dictionary `emission_probability` where each key is a state, and the value is another dictionary with the probabilities of each amino acid being emitted from the state.

Output:
Return a string representing the most likely sequence of states.

Examples:
plaintext
```
sequence = "ACDE"
states = ['Alpha-helix', 'Beta-sheet', 'Coil']
start_probability = {'Alpha-helix': 0.6, 'Beta-sheet': 0.3, 'Coil': 0.1}
transition_probability = {
   'Alpha-helix' : {'Alpha-helix': 0.5, 'Beta-sheet': 0.2, 'Coil': 0.3},
   'Beta-sheet' : {'Alpha-helix': 0.3, 'Beta-sheet': 0.5, 'Coil': 0.2},
   'Coil' : {'Alpha-helix': 0.2, 'Beta-sheet': 0.3, 'Coil': 0.5}
}
emission_probability = {
   'Alpha-helix' : {'A': 0.2, 'C': 0.3, 'D': 0.3, 'E': 0.2},
   'Beta-sheet' : {'A': 0.1, 'C': 0.4, 'D': 0.3, 'E': 0.2},
   'Coil' : {'A': 0.3, 'C': 0.2, 'D': 0.2, 'E': 0.3}
}
```