1. Explain *in your own words* the proof of the optimal substructure property for the Huffman code problem.

2. Given a graph $G = (V, E)$ and two vertices $u$ and $v$, the shortest path length problem asks for the length (number of edges) of a shortest path between $u$ and $v$. Does this problem have optimal substructure? Justify your answer.

3. Analyze the properties of the following problem, and then design an efficient algorithm for it. Also, analyze the time and space complexity of your algorithm: Given $n$ integers $S(0), S(1), \ldots, S(n)$, find an $i$ and a $j$ such that $1 \leq i < j \leq n$ and the sum of the numbers $S(i) \ldots S(j)$ is minimum.

4. The book discusses a sufficient condition for the greedy algorithm for coin-changing to be optimal in the exercises and problems. Does it cover the Euro and US currencies? Explain why or why not.

**Note:** Remember the academic honesty policy for the course.