

Foundation of Computer Science — FM2

Assignment 7

Watch all the remaining video lectures (of Week 6).

1. Give the formal definition of the notion of **NP**-complete problem. Explain the intuition.
2. A k -clique in a graph G is a set of k nodes of G such that there is an edge between every two nodes in the clique. The problem CLIQUE is:

Given: a graph G and a constant k

Question: Is there a k -clique in G ?

Prove that CLIQUE is **NP**-complete.

Hint: Use a reduction from the Node Cover Problem to CLIQUE.

3. Consider the following problems:

SP (Set Partition = Partition Knapsack):

Given: non-negative integers n, a_1, a_2, \dots, a_n

Question: Is there a set $I \subseteq \{1, 2, \dots, n\}$ such that $\sum_{i \in I} a_i = \sum_{i \notin I} a_i$?

SOS (Sum of Subset):

Given: non-negative integers $m, a_1, a_2, \dots, a_m, b$

Question: Is there is set $J \subseteq \{1, 2, \dots, m\}$ such that $\sum_{i \in J} a_i = b$?

Give poly-time reductions from SP to SOS and from SOS to SP.