

Ειδικά Θέματα Αλγορίθμων Ασκήσεις Φροντιστηρίου #9 Approximation Algorithms

1. Give a greedy approximation algorithm for the MAX COVERAGE problem.

(MAX COVERAGE: Given a universe $U = \{e_1, e_2, \dots, e_n\}$, a list of sets $S_i \subseteq U$ (possibly overlapping) and a bound k , the goal is to pick k sets S'_1, S'_2, \dots, S'_k such that $|\bigcup_{i=1}^k S'_i|$ is maximized.)

2. a) Design an optimal algorithm for the fractional version of KNAPSACK problem.
b) Design an approximation algorithm for the 0-1 version of KNAPSACK problem.

(KNAPSACK: As input, Knapsack takes a set of n items, $S = \{a_1, \dots, a_n\}$, each with a weight $w(a_i) \in \mathbb{Z}^+$ and a value $v(a_i) \in \mathbb{Z}^+$, a “knapsack capacity” $B \in \mathbb{Z}^+$.

Find a subset of objects whose total weight is bounded by B and total value is maximized.)