

COMP 550-002. Spring 2016

Homework assignment 5

Assigned: April 18.

Due: In class, April 27

Honor pledge. When submitting your work, please include a signed honor pledge statement: *I certify that no unauthorized assistance has been received or given in the completion of this work.* Also, remember to list your collaborators as stated on the course syllabus. Assignments without these will not be graded.

Qn 1. The MULTIPROCESSOR SCHEDULING problem is defined as follows

Instance Set J of jobs, number $m \in \mathbb{Z}^+$ of processors, length $\ell(j) \in \mathbb{Z}^+$ for each $j \in J$, and a deadline $D \in \mathbb{Z}^+$.

Question Is there an m -processor non-preemptive schedule for J that meets the overall deadline D , i.e., a function $\sigma : J \rightarrow \mathbb{Z}_{\geq 0}$ such that for all $u \geq 0$, the number of jobs $j \in J$ for which $\sigma(j) \leq u \leq \sigma(j) + \ell(j)$ is no more than m and such that, for all $j \in J$, $\sigma(j) + \ell(j) \leq D$?

- a. Informally describe a polynomial-time 2-input verification algorithm for this problem, thereby establishing that MULTIPROCESSOR SCHEDULING \in NP.
- b. Show that MULTIPROCESSOR SCHEDULING is NP-hard by reducing PARTITION to MULTIPROCESSOR SCHEDULING.

Qn 2. The SUBSET SUM problem is defined as follows

Instance finite set A , a size $s(a) \in \mathbb{Z}^+$ for each $a \in A$, a positive integer B .

Question Is there a subset $A' \subset A$ such that the sum of the sizes of the elements in A' is exactly B ?

Prove that the SUBSET SUM problem is NP-complete.

Qn 3. Do Question 34-2 parts (c) and (d) from your text.