Question 4

We can reduce the PARTITION problem into a LIST SCHEDULING problem in polynomial time.

In PARTITION we want to find two subsets of equal summed value. To transform PARTITION into LIST SCHEDULING, take $m = 2$ and $d = \frac{\sum_{i=1}^{n} x_i}{2}$, and then assign $p = x$. This transformation runs in $O(n)$. If there is a subset that is equal, LIST SCHEDULING will return that all jobs can be completed before the deadline.

Since PARTITION is NP-hard, and can be transformed into LIST SCHEDULING in polynomial time, LIST SCHEDULING must be NP-hard as well.