Problems for Tutorial 7

1 Task Scheduling with Finitely Many Processors

Consider a poset of W tasks where each task requires unit time to be completed. Let D be the length of the longest (critical) path. Show that if we have P processors then we can complete all the tasks in at most $D + \left\lfloor \frac{W}{P} \right\rfloor$ time steps. Show that this bound is within a factor of 2 of the optimal for that set of tasks run on an arbitrary number of processors.

2 Conflict Graphs

Consider a collection of tasks $T_1, ..., T_n$, where each T_i has a set of resource requirements S_i. (Each S_i is a subset of some universal set of resources R.) Each task needs exclusive access to its resources when it executes and each task requires unit time to be executed.

(a) In terms of the T_i's and the S_i's, define a conflict graph describing which tasks cannot execute at the same time.

(b) If each task is supposed to execute once, describe in terms of your conflict graph, a minimum-time schedule for all of them to execute. How long does it take for all the tasks to be executed?