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Artificial Intelligence – for Professor Davis

Problem 1:

1. If we are to characterize the scheduling problem as a tree-structured state space search problem, then we could consider each level i of the tree to represent task i, with the state being which process the task has been assigned to. So each node i of the tree has exactly two children, representing whether the next (i+1)-th task is given to process 1 or process 2. Therefore the operator is the switching of a task from task 1 to task 2, and the branching factor is exactly 2. The depth of the goal node is then always going to be 4, since we need to assign every task to a process.
2. Below is an example of a portion of the state space for a depth-first search of the state space in the above example.

T­T4: P1

T­3: P1

T­4: P1

T­3: P1

T­4: P1

T­3: P2

T­2: P1

T­1: P1

ø

T­4: P2

T­4: P2

T­2: P1

T­4: P2

1. Below is an example of the state history for a breadth-first search

T­2: P1

T­3: P1

T­3: P1  T­3: P2 T­3: P1  T­3: P2 T­3: P1  T­3: P2 T­3: P1  T­3: P2

T­2: P1

T­1: P1

ø

T­4: P1 |T­4: P2­ |T­4: P1 |T­4: P2­ |T­4: P1­ |T­4: P2­ |T­4: P1­­|T­4: P2­ |T­4: P1 |T­4: P2­ |T­4: P1­ |T­4: P2­

T­2: P2

T­1: P2

T­2: P2

Problem 2:

1. In this scenario, there are now 3 states: being assigned to process 1, being assigned to process 2, and not being assigned to any process (which we will denote state ø). Note that tasks that are at depths not yet been reached by the search are assumed to have state ø. So the branching factor is now 3, and the operators are toggling from process 1 to process 2, and toggling from process 2 to becoming unassigned. The main difference is that the goal state is now different. Now the constraint that all task be assigned to a process has been lifted, and in its place we have a constraint on the total value of all tasks being greater than S=110. Therefore the depth of the goal state is no longer fixed: it could be less than 4 if that satisfies both the deadline and total value criteria, for example if the goal state has T­­4 assigned to state ø.
2. Note I have left out the labels for the states at depths>2 for readability purposes

T­2: ø

T­2: P2

T­2: P1

T­2: ø

T­2: P2

T­2: P1

T­1: P1

ø

T­1: P2

1. Again there is no difference in the state history for problem 2 relative to problem 1 the only difference is that the goal state is now different.

T­2: ø

T­2: P2

T­2: P1

T­2: ø

T­2: P2

T­2: P1

T­2: ø

T­2: P2

T­2: P1

T­1: P1

ø

T­1: P2

T­1: P2