**CS 480 Homework 5**

**Planning**

**1.**

Consider the following simple domain:

 Initial State: A, B, C

 Goal: C, D, E

 Operator O1 Preconditions: A; Add Effects: F; Delete Effects: C

 Operator O2 Preconditions: A; Add Effects: D; Delete Effects: B

 Operator O3 Preconditions: B; Add Effects: C

 Operator O4 Preconditions: F; Add Effects: D, E, G

a. **State-Space Search**: Draw the full search tree with a depth limit=2 in a forward progression state-space search (assume no repeated states). For full credit, be sure to show the list of predicates (or the equivalent graphical representation of the blocks) for each state, and explicitly label the actions that get you from one state to another (as in Figure 10.5). State whether your search finds a plan which achieves the goal, and why?

b. **Partially Ordered Planning**: Show the final plan that would be output by a partial-order planner for this problem. Give an example of one linearization of the partial-order plan.

**2.**

A robot is at location A in a room. There is a box at location C. The robot wants the oil can that is high on a shelf at location B, but it needs to move the box and climb onto it in order to reach the oil can.

Given the following STRIPS operators/information, construct a partial-order plan (similar to shown in the class notes). Be sure to include both causal links (between effects and preconditions) and ordering constraints (to resolve threats, if any). Make sure we can tell the difference between the two!

ACTIONS:

*% move from location X to Y*

Preconditions: At(X), Level(low)

Action: **Move(X, Y)**

Effects: ¬At(X), At(Y)

*% climb up on the box*

Preconditions: At(Location), BoxAt(Location), Level(low)

Action: **ClimbUp(Location)**

Effects: Level(high), ¬Level(low)

*% climb down from the box*

Preconditions: At(Location), BoxAt(Location), Level(high)

Action: **ClimbDown(Location)**

Effects: Level(low), ¬Level(high)

*% move robot and box from X to Y*

Preconditions: At(X), BoxAt(X), Level(low)

Action: **MoveBox(X, Y)**

Effects: BoxAt(Y), ¬BoxAt(X), At(Y), ¬At(X)

*% take the oil can*

Preconditions: At(Location), OilCanAt(Location), Level(high)

Action: **TakeOilCan(Location)**

Effects: Have(OilCan)

INITIAL STATE: **At(A), Level(low), BoxAt(C), OilCanAt(B)**

GOAL STATE: **Have(OilCan)**