EECS 492: Introduction to AI
Homework 4 (100 pts)

Exercise 1 (10 pts)

1. [4 pts] show the preconditions and effects of *MoveToTable(A, B) and Move(B, Table, C)*

MoveToTable(A, B)
Precond*: On(A, B) ^ Clear(A) ^ Block(A) ^ (A ≠ B)*
Effect: On(A, Table) ^ Clear(B) ^ ¬On(A, B)

Move(B, Table, C)
Precond: On(B, Table) ^ Clear(B) ^ Clear(C) ^ Block(B) ^ Block(C) ^ (B ≠ Table) ^ (B ≠ C) ^ (Table ≠ C)
Effect:
(1) not considering A on table: On(B, C) ^ Clear(Table) ^ ¬On(B, Table) ^ ¬Clear(C)
(2) considering A on table: On(B, C) ^ ¬On(B, Table) ^ ¬Clear(C)

2. [6 pts] show why achieving the subgoals first would prevent achieving the goal state
Hint: to achieve the goal state, a subgoal can be *On(A, B)* or *On(B, C)*

Sussman Anomaly
On(A,B) already achieved, can't achieve on On(B,C)
On(B,C), can't achieve without moving A to Table, but A can't be moved to Table since On (A, B) is a subgoal.
So can't achieve On(A,B) ^ On(B,C)

A non-interleaved planner will concatenate a plan for On(A, B) with a plan for On(B,C). On(A,B) is already established, so that plan will be empty. On(B,C) can only be established by removing On(A,B). So the latter half of the plan will undo the former half. A non-interleaved planner has no mechanism for fixing this problem.

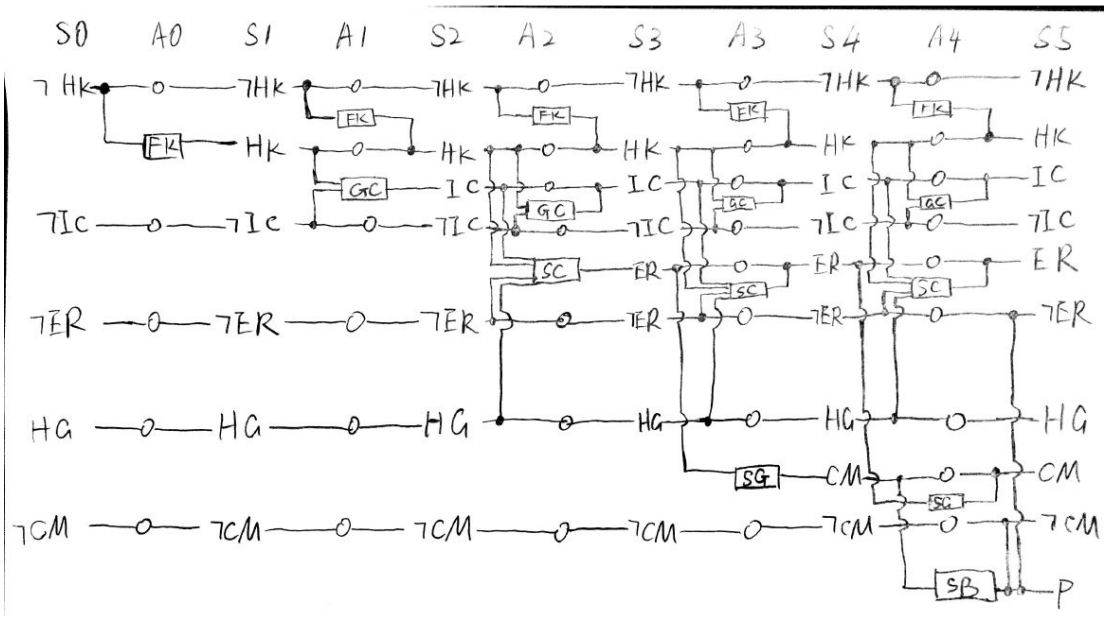
Exercise 2 (32 pts)

1. [15 points] We will consider the five actions described above. Describe the action schema for each of the five actions.

(i) Action: FK,
Precond : ¬HK
Effect : HK
(ii) Action: GC,
Precond : HK ^ ¬IC
Effect: IC
(iii) Action: SC,
Precond: HK ^ IC ^ HG ^ ¬ER
Effect: ER
(iv) Action: SG,
Precond : ER
Effect: CM
(v) Action: SB,
Precond : CM
Effect : ¬CM ^ ¬ER ^ P

2. [12 points]

6 levels, see figure below



3. [4 points] Should list at least the following mutexes. There may be more.

Persistent action CarMoving (interference, inconsistent effects)
Persistent action of EngineRunning (interference, inconsistent effects)
SteponGas (inconsistent effects, interference)
StartCar (inconsistent effects)

4. [1 point] Which literals are mutex with *EngineRunning (ER)*? (Mention the literal with the type of mutex, if there are more than one mutexes between two literals then mention all the types)

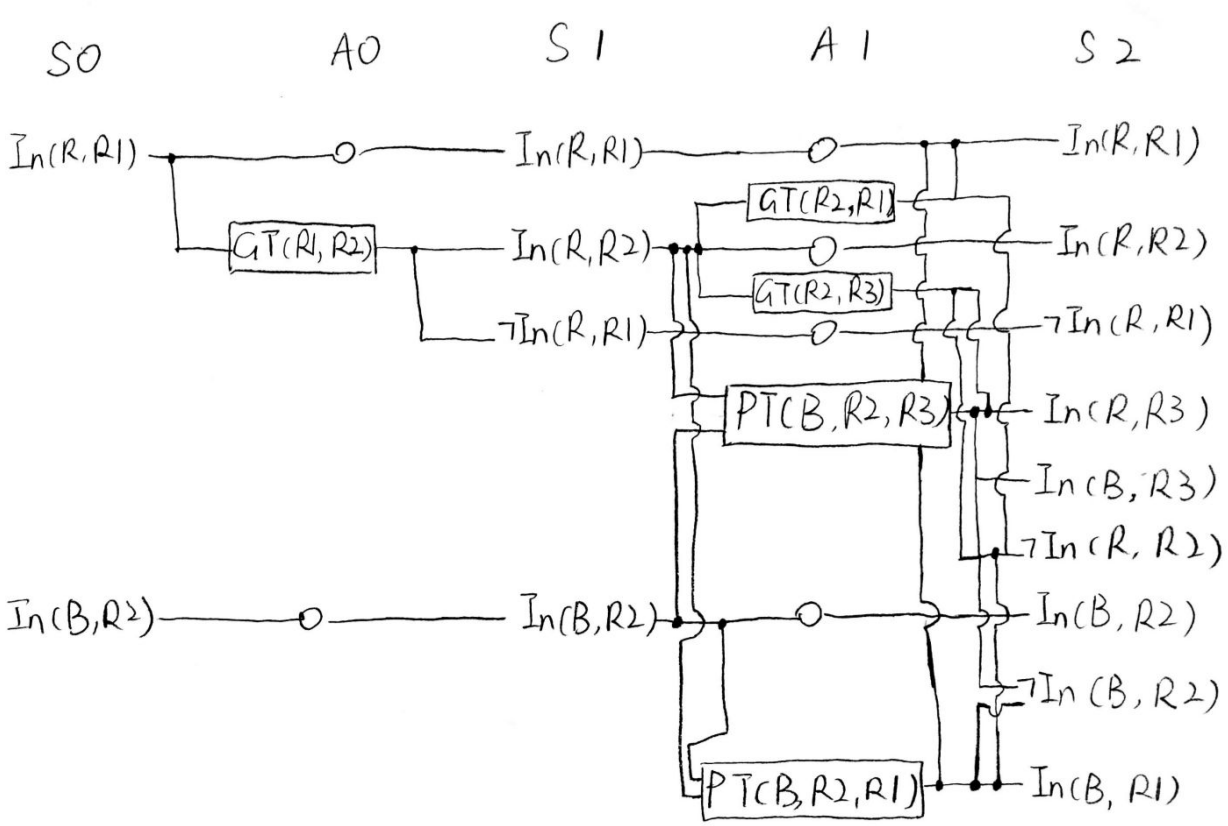
   ¬ER (negation/inconsistent support) , P (inconsistent support from action SC and SB)

Exercise 3 (18 pts)

1. [2 points] Write out the state descriptions for the initial and goal states given three room world.

(One point for initial and one for goal)
Initial State: In(R,R1) ^ In(B1,R2)
Goal State: In(B1,R3) **(^ In(R,R3) optional)**

2. [10 points]



3. [5 points]

A0: GoThru(R1, R2) & P(In(R, R1)) [inconsistent effects, interference]

S1: In(R, R1) & ¬In(R, R1) [inconsistent support]
In(R, R1) & In(R, R2) [inconsistent support]

4. [1 point]
H = 2

Exercise 4 Forward/Backward Chaining (40 pts)

- See solution file for code.

Task #	Forward	Backward (Only 3 needed)
1	Yes	Yes
2	Yes	Yes
3	Yes	Yes
4	Yes	Yes
5	Yes	No