Topic 4.2. Tower Building Problem in a Blocks World

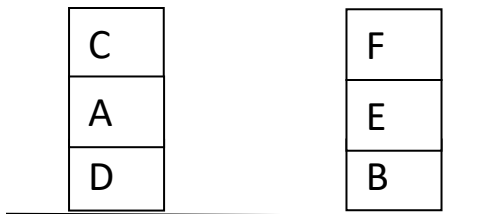**A) Representation of the problem**
   a) Initial State
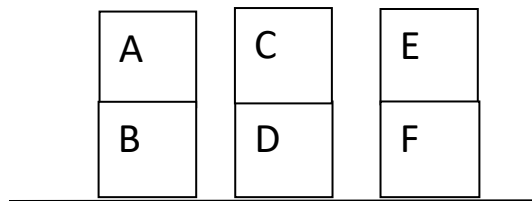
Block(A) ∧ Block(B) ∧ Block(C) ∧ Block(D) ∧ Block(E) ∧ Block(F) ∧ On(Table, B) ∧ On(Table, D) ∧ On(Table, F) ∧ On(B, A) ∧ On(D, C) ∧ On(F, E) ∧ Clear(A) ∧ Clear(C) ∧ Clear(E)

   b) Goal State

On(D, A) ∧ On(A, C) ∧ On(B, E) ∧ On(E, F) ∧ Clear(C) ∧ Clear(F)

c) Action Schemas:

  i) Action: Move(b1, x, b2)
      Precondition: Block(b1) $\wedge$ Block(b2) $\wedge$ On(x, b1) $\wedge$ Clear(b1) $\wedge$ Clear(b2)
      Effect: On(b2, b1) $\wedge$ $\neg$On(x, b1) $\wedge$ Clear(x) $\wedge$ $\neg$Clear(b2)

  ii) Action: MoveToTable(b1, b2)
       Precondition: Block(b1) $\wedge$ Block(b2) $\wedge$ On(b2, b1) $\wedge$ Clear(b1)
       Effect: On(Table, b1) $\wedge$ $\neg$On(b2, b1) $\wedge$ Clear(b2)
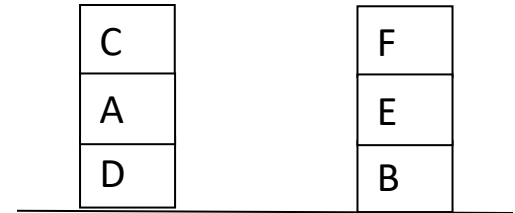
B) Construction of a plan through Forward State Space Search

Initial State	Action 1	State 1 Goal test = False	---------	State n Goal test = True

Action 1, Action 2, … are practically groups of actions that can be executed in parallel.
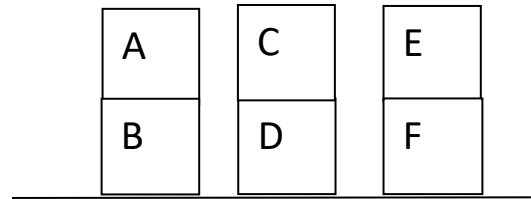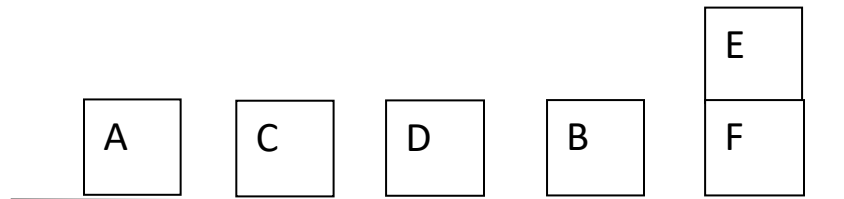
Initial State

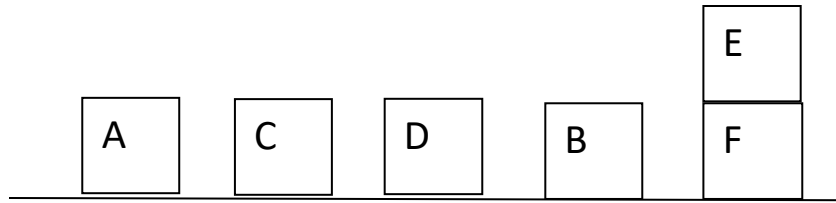Goal State

Action 1:
MoveToTable(A, B)
MoveToTable(C, D)

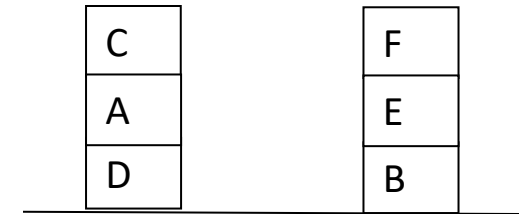State 1: **[Predicate 'Block' has been omitted.]**
On(Table, B) ∧ On(Table, D) ∧ On(Table, F) ∧ ~~On(B, A) ∧ On(D, C) ∧~~ On(F, E) ∧ Clear(A) ∧ Clear(C) ∧ Clear(E) ∧ **On(Table, A) ∧ On(Table, C) ∧ Clear(D) ∧ Clear(B)**

Goal test: False

State 1

Goal State

State -----------: [Predicate 'Block' has been omitted.]

On(Table, B) ∧ On(Table, D) ∧ On(Table, F) ∧ ~~On(B, A) ∧ On(D, C)~~ ∧ On(F, E) ∧ Clear(A) ∧ Clear(C) ∧ Clear(E) ∧ **On(Table, A) ∧ On(Table, C) ∧ Clear(D) ∧ Clear(B)**

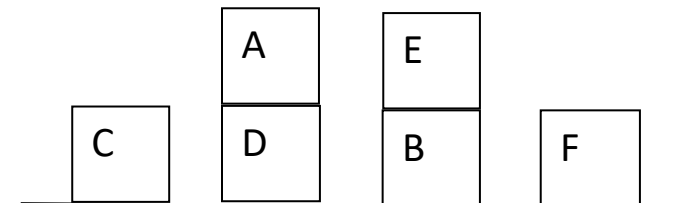Goal test:-------------

Action 2:
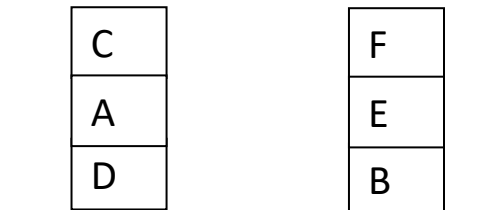Move(A, Table, D)
Move(E, F, B)

State 2

Action 3:
Move(C, Table, A)
Move(F, Table, E)

Plan: Action 1, Action 2, Action 3; **Is it optimal both in time and number of actions?**