

ASSIGNMENT 1
FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

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M.Tech. AI (Semester I)

Give a complete problem formulation for the following two problems.

Q.1. There are six glass boxes in a row, each with a lock. Each of the first five boxes holds a key unlocking the next box in line; the last box holds a banana. You have the key to the first box, and you want the banana.

A.1.

State Space: No of states = $7 * 2 = 14$

```
{  
  "All six boxes are locked",  
  "First box is unlocked. Remaining five boxes are locked",  
  "First two boxes are unlocked. Remaining four boxes are locked",  
  "First three boxes are unlocked. Remaining three boxes are locked",  
  "First four boxes are unlocked. Remaining two boxes are locked",  
  "First five boxes are unlocked. Remaining one box is locked",  
  "All six boxes are unlocked"  
}
```

```
{  
  "I don't have the banana",  
  "I have the banana"  
}
```

Successor function:

- **Actions:**
 - Unlock a locked box
 - Pick an item from one of the open boxes
- **Cost:** Number of actions performed

Start State: "All six boxes are locked" and "I don't have the banana"

Goal Test: Are "All six boxes are unlocked" and "I have the banana"?

Q.2. You start with the sequence ABABAECCCEC, or in general any sequence made from A, B, C, and E. You can transform this sequence using the following equalities: $AC = E$, $AB = BC$, $BB = E$, and $E x = x$ for any x . For example, ABBC can be transformed into AEC, and then AC, and then E. Your goal is to produce the sequence E.

A.2

State Space

The set of all possible sequences made from A, B, C, and E.

Successor function:

- **Actions:**
Each possible transformation corresponds to an action.
 - $AC = E$,
 - $AB = BC$,
 - $BB = E$, and
 - $E x = x$ for any x
- **Cost:** Number of actions (transformations) performed

Start State

ABABAECCCEC or in general any sequence made from A, B, C, and E

Goal Test

Is the sequence E?