Tutorial 2

To understand state space problem formulation.

Name :- Pranali Jibhau Jagtap

Roll No. :- 25

Subject :- IS

class :- BEI7

D.O.P	D.O.C	Marks	Sign

Tutorial 2

1.2

To understand State Space problem Formulation

Aim : To understand state Space based problem formulation of AI problems so that problem solving Agent ~~and~~ ~~Environments~~ can be applied.

Theory :- First we understand the problem solving agent. Algorithm shown in Figure 3 shows agent program for problem, then determenies or rather searches an action sequence, after which it return the next action to be executed in sequential manner

```
Function SIMPLE-PROBLEM-SOLVING(Precept) return an action
  Static : seq, an action sequence, initially empty
           State, some description of current world state
           goal, a goal, initially ~~empty~~ null
           problem, a problem Formulation.
  state ← UPDATE-STATE (state, percept)
    if seq is empty then do
          goal ← FORMULATE-GOAL(state)
          problem ← FORMULATE-PROBLEM (state, goal)
          seq ← SEARCH (problem)
          action ← FIRST(seq)
          seq ← REST(seq)
        return action.
```

Figure 3: Problem Solving Agent Architecture.

Defining the Problem is referred to as problem Formulation. It involves defining following Five things:-

Initial state :- It is the starting state that the problem is in.

Action :- It defines all possible action available to agent given it is in some state currently. It is a function Action. that return list of all possible actions.

Transition Model :- It also known as sucessor function which define. which state the system tend to move to when a particular action in executed by the agent. Sucessive application of Transition model gives rise to what is known as State space.

Goal Test :- This act as a stopping condition when the state passed to this function is goal state it will return true and Searching would stop.

Path cost :- It is accumulated cost of performing certain sequence of actions. This can help in determining weather the action sequence under consideration is optimal.

Thus a problem can Formally specified by Identifying initial state, action coperations) transition model (Sucessor Function), goal test and path cost. In term of problem solving agent solution is the path Form initial state to a goal State, optimal solution is the lowest path cost of all solutions, process of Finding a solution is called Search.

Working :- Based on understanding of problem Formulation students needs to Formulate Following problem. They will clearly show state Space up to depth level 3 or till goal node which ever is shallowest.

1. Navigate to KGCE Workshop From HOD IT cabin with minimum number of moves, moves can be climbing or alighting staircase, turning left walking through a corridor
2. 8 puzzle problem
3. The missionaries and cannilable problem. There are three missionaries and three cannibals who must crosss a river using a boat which can carry at most two people, under the constraint that, For bothe banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals if they were, the cannibals would eat the missionaries. The boat cannot crossthe

cross the river by itself with no people on board.

4. ~~Cross~~ N Queen's problem Arrange N Queens on N cross N chees board where no two queens attack each other.

5. ~~A~~ Two room vaccum cleaner world

6. Water Jug problem.

~~Resources :- Refer to second chapter from Artificial Intelligence A modern approach.~~

i) 8-Puzzle problem :-

The problem can be formulated as :-

- States : states can be reprsented by a 3x3 matrix data structure with blank denoted by an underscore '_'.

1) Initial State :- {{1,2,3},{4,8,-0}, {7,6,5}}

2) Actions :- The black space moves in left, right, up and down direction specifying the actions.

3) Succesor function :- If we apply 'down' operation to the state the next state has '5' and '_' switched.

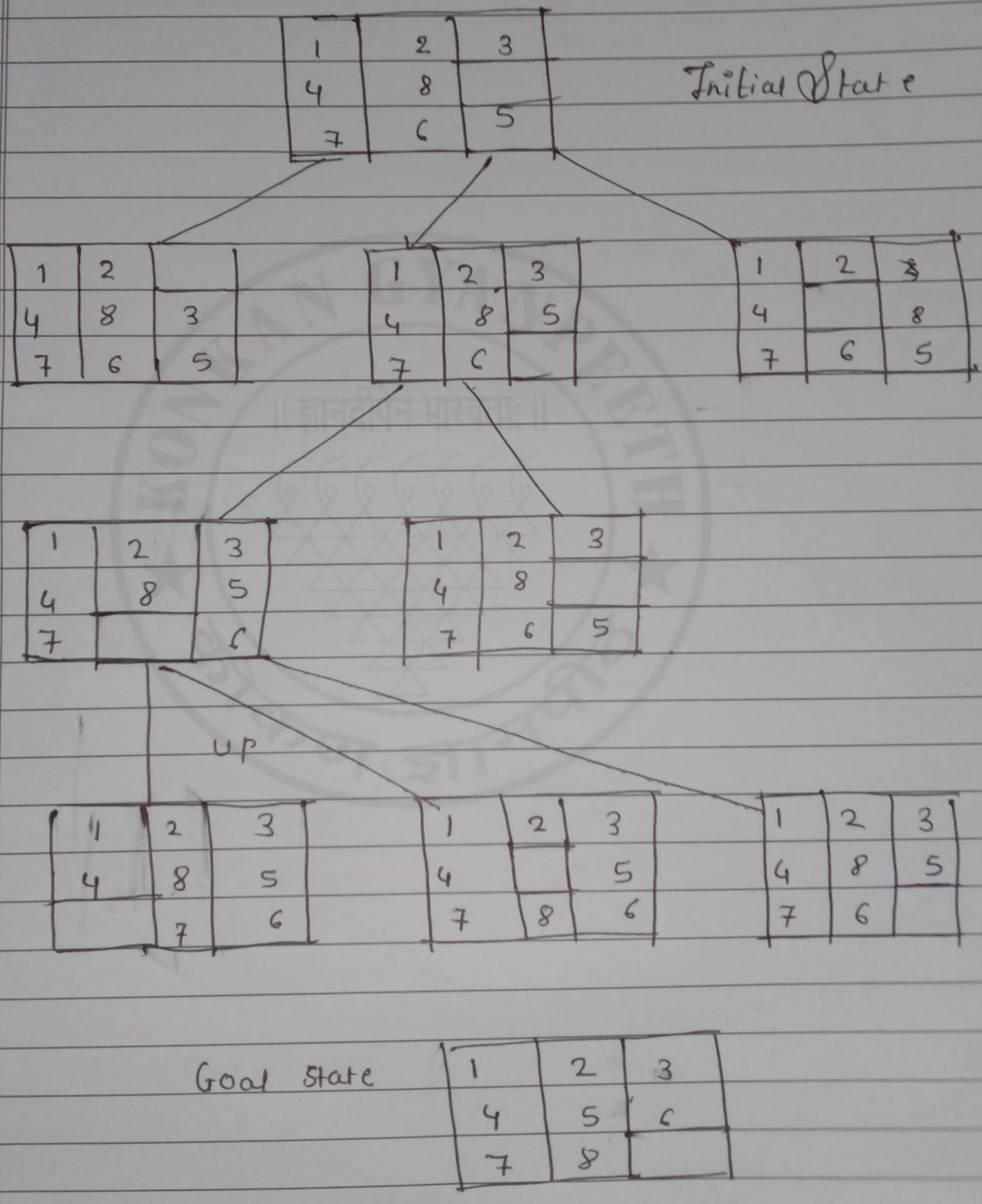
4) Goal text = {{1,2,3},{4,5,6},{7,8,-}}

5) path cost :- Number OF steps to reach to the final state.

Page No. :
Date :

KGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCE

8-Puzzle Problem :-



Solution :- Solve in 5 step.

K.G.C.E.
Karjat - Raigad

Page No. :
Date :

KGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCEKGCE

Water Jug Problem :-

There are two jugs of volume A litre and B litre Neither has any meassuring mark on it. There is a pump that can be used to Fill the jugs with water.

A water Jug problem. you are give two Jug, a 4-gallon and 3-gallon one a pump which has unlimited water which you can use to Fill the jug. and the the ground. on which water may Poured.