

MIT SCHOOL OF ENGINEERING

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MIT-ADT
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A Step Towards World Class Education

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Subject: A.I. Roll No.: 2175052 Exp. No.: 01

Name of the Experiment: _____

Performed on: _____

Submitted on: _____

Marks	Teacher's Signature with date
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Q1. Characterize the 8-puzzle game agent on the basis of following parameters.

Ans.

(i). Observability:-

Full observable: As in a 8 puzzle game we see the whole board & the next step that we can take to complete the target task.

(ii). Determinism: 8-puzzle game is deterministic in nature as the next step in game completely depend on the current step action which we take.

(iii). Episodic / sequential: It is sequential in nature as if we take a step the other side step which we look will be affected.

Incomplete for Theory ☐ Diagrams ☐ Observation Table ☐

Calculations ☐ Graphs ☐ Results ☐ Conclusion ☐

Plagiarism ☐ Late Submission ☐ Neatness ☐

Teacher's Signature

(iv) Static / Dynamic:

In 8 puzzle game, we have a target-goal where we have to reach.

(v) Discrete / Continuous:

As number of moves one can take are distinct {left, right, up, down}

(vi) Single or multi-agent:

Only one player plays it at a time.

Q2. Tic-tac-toe problem

Ans.

(i). Formulate the initial & goal state.

→ a) Initial state: 3×3 empty set.

→ b) Goal state: X win, O win, or draw.

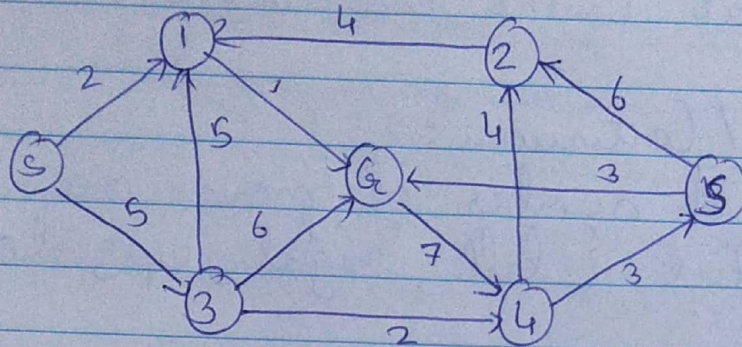
(ii). Identify the state:-

→ State move first & they take turn until its game over.

(iii). Describe the successor function:-

→ List of move state pair, specify legal moves.

Q3. For given tree below with start node & goal node, answer the following:-



S is starting node
G is goal node.

Ans.

(i). Give the ordering of nodes visited. Show how the fringe is updated with each node visited

→ Step 1:-

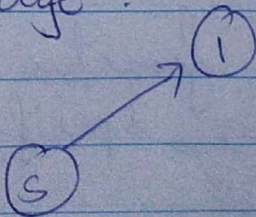
Push 'S' in the fringe
Pop 'S' & then push its adjacent nodes to which it can travel.

(S)

Fringe (1) (3)

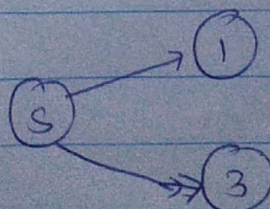
Step 2:-

Pop '1' & push its adjacent nodes in the fringe.



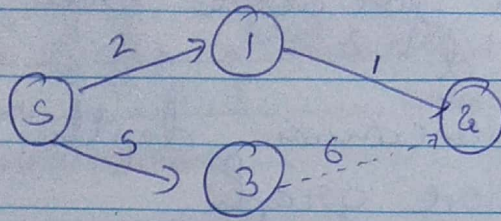
Fringe (3) (6)

Step 3:-



Fringe (6)

Step 4:-



Order :- i) S - 1 - G

Total Cost = 3

ii) S - 3 - G

Total Cost = 11

(ii). Give the path sequence for the uniform cost search algorithm.

→

Path :- S → 1 → G

Uniform Cost :- 3.

(iii). Give the time complexity of the UCS state space search algorithm, what does the term 'b' stand for.

→ C^* is the ~~low~~ optimal cost of the optimal ^{*} solution & E is each step to get closer to goal node.

The no. of step = $C^* / E + 1$

∴ T.C = $O(b^{[C^*/E]})$ // worst case

b (branching factor).

(iv) If 'd' is termed as the shallowest goal node then for above tree, what is the value of 'd'?

→ 'd' is the maximum depth
 $d=2$ for above graph.

(v) Comment on the completeness & optimality of the algorithm.

→

- Completeness:-

UCS does not care about no. of steps. It will get stuck in infinite loop if path with infinite sequence of zero cost. Completeness is guaranteed only if the cost of every step is some +ve number.

- Optimality:-

UCS is optimal. This is because of every step the path will be the least cost is chosen & path never get shorter as nodes are added, insuring searched informed next in order of their optimal path cost.