Final Assesment
Dept of CSE / CSIT
Program:- B.Sc. in CSIT
Course title:- Artificial Intelligence
Course Code:- CSE 341

Name:- Nusrat Jahan Tanshee
ID:- 2520200011
Batch:- 20
Sem:- Spring 2023

Ans to the Q no - 1(a)

Blind Search Algorithms:- These algorithms are brute force operations and they don't have additional information about the search space. The only information they have is on how to traverse. Thus uninformed search algorithms are also called blind search algorithms.

List of blind search algorithms are:-

- Depth first search
- Breadth first search
- Depth limited seach
- Uniform cost search
- Iterative deepening depth first search
- Bidirectional search (if applicable)

Properties of some common blind search algorithms:-

(1) **Breadth first search:-** **Property:-** BFS ~~exte~~ expands the shallowest unexpanded node first, i.e. it explores all the neighboring nodes before moving to the next level of the search tree.

Completeness:- BFS is complete if the branching factor is finite and there is a solution.

Optimality: BFS guarantees an optimal solutions when the cost of each steps is uniform.

③ Depth first search: Property:- DFS expands the deepes unexpanded node first, i.e. It explores as far as possible along each branch before back tracking.

Completeness:- DFS is not complete if the search space contains loops or infinite paths.

④ Iterative depending Depth-first search (IDDFS)

Property:- IDDFS is a combination of depth-first search and breadth first search. It proform depth-limited search iterative gradually increasing the depth limit until a solution is found.

⑤ Depth-limited search:- Property:- DLS limits the death of the search to a pre-defined level, beyond which nodes are not expanded.

⑥ Bidirectional search:- ~~Bidirecti~~ Property:- Bidirectional search explores the search space from both the initial and goal states, meeting in the middle.

Ans to the Q no-1(b)

(4) The 4 general steps of problem solving are a systematic approach to finding solutions. They provide a framework for tackling problems in a structured manner. Here is a brief description of each step.

(1) Define the problem:-

The first step in problem solving is to clearly define and understand the problem at hand. This involves identifying the specific issue determining its scope and boundaries, and gathering all relevent information. By clearly defining the problem. You set the foundation for finding an effective solution.

(2) Generate possible solutions:-

Once the problem is defined, the next step is generate a range of possible solutions. This involves brain storming and considering different ideas, approaches and perspective. The goal is to explore various options and be open to creative solutions without judgement or evaluation at this stage.

(3) Evaluate and select a solution:-

After generating a list of possible solution the next step is

to evaluate each options and select the most appropriate one. This involves analyzing the potential pros and cons of each solution. Considering factors such as feasibility, effectiveness, resources required and potential outcomes. It is important to critically asses the solutions and choose the one that best ~~at~~ aligns with the defined problems and desired outcome.

④ Implement and Review:-

Once a solution is chosen, the next step is to impliment it. This involves putting the selected solution into action and executing the necessary steps. Its important to moniton the progress, gather feedback and asses the effectiveness of the implemented solution.

Following these four steps, problem solvers can increase their chances of finding effective and efficient solutions to a wide range of problems.

Ans to the Q.no-2(a)

States:- According to one definition, a states is a community formed by people and exercising permanent power within a specified territory.

In AI a process known as state space search is used to explore all potential configuration or state of an instance until one with the necessary feature is found. A state is a time snap shot representing some aspect of the problems.

Initial states:- Initial state starts in:

Path → A sequences of states commanded by the sequence of action.

Predecessor → Any node that is higher up on the tree, then the one that is being considered.

Successor → Any node that is a child of any node, etc.

Action:- Action selection in AI system is a basic system in which the problems can be analyzed by the machine to understand what has to do next to get closer to the solution.

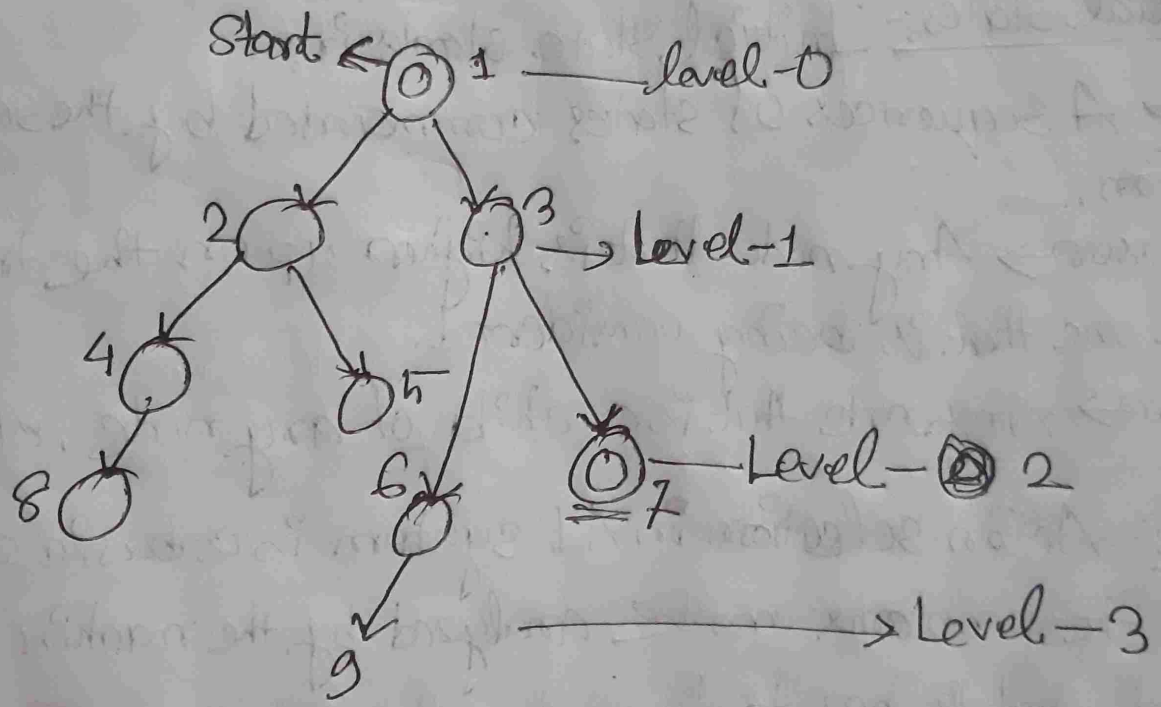
Goal test- A test that determines whether a given state is a good state.

Path cost:- A function that assigns a numeric value to each path solution. A path from the initial to the goal state.

~~Optimal solution:~~

Optimal solution → One that has the lowest path cost among the solution.

Ans to the Q no-2(b)

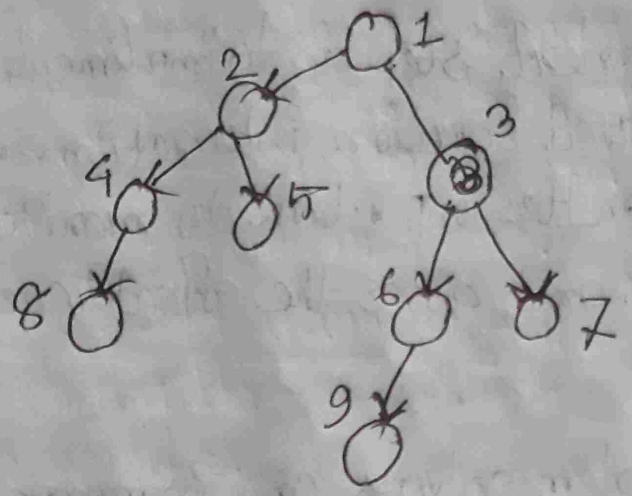


BFS: 1, 2, 3, 4, 5, 6, 7, 8, 9.

Ans to the Q no-3(a)

DFS:- DFS Normally 3 Step flow procedure.

(i) Preorder (Root → left → right)
(ii) In order (Left → Root → Right)
(iii) post order (Left → right → root)



(i) **Pre order:** 1, 2, 4, 8, 5, 3, 6, 9 7

(ii) **In order:** (Left → Root → Right)

⇒ 8, 4, 2, 5, 1, 6, 9, 3, 7

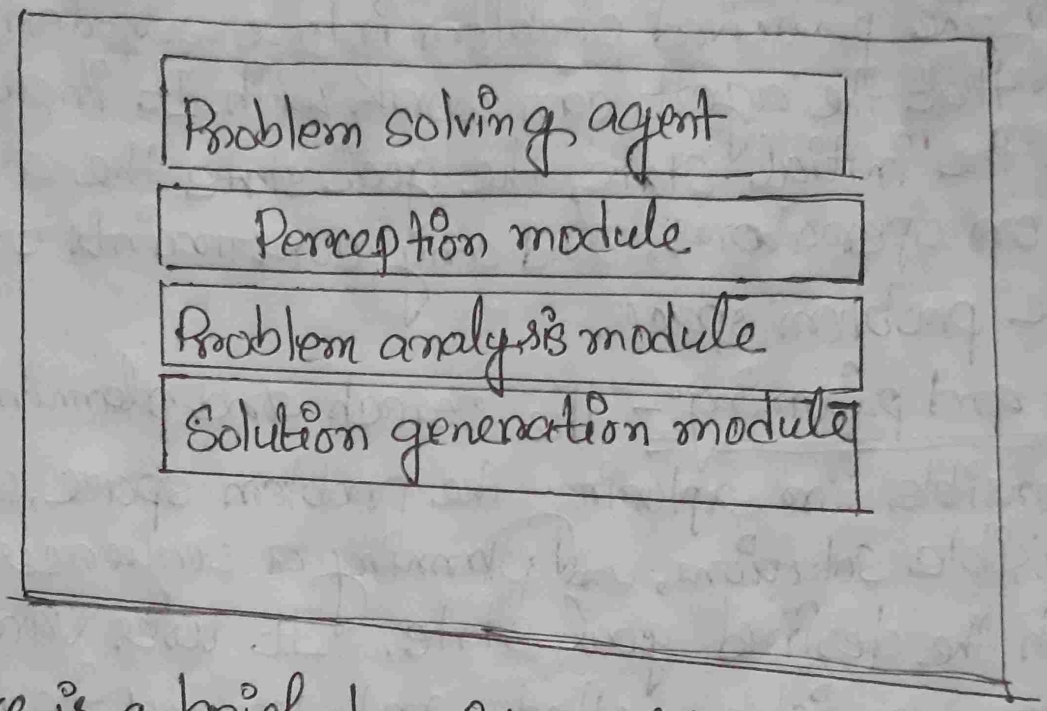
(iii) **Post order:-** (Left → Right → Root)

⇒ 8, 4, 5, 2, 9, 6, 3, 7

Ans to the Q. no-4(a)

A problem solving agent is an entity, typically an intelligent system or program, that is designed to analyze problems, generate solutions and take actions to achieve desired goal or outcome.

Here is a diagram showing problem solving agents:-



Now here is a brief description of how these module work together:-

① Sensors:- Sensors are responsible for perceiving the environment and gathering relevant information about the current states of the agent allowing it to observe and understand the problem. Sensors can include various types of input devices.

(3) Knowledge base:- The knowledge base represents the agents interrepository of information, facts, rules, about the problem domain. It contains pre existing knowledge and learned information that the agent can use to reason, make decisions and generate solutions.

(4) Problem formulation:- Problem formulations involves converting the perceived problem into a well-defined representation that the agent can work with. It includes defining the initial state, the goal state the available actions or operatores, and any constraints or limitations within the problem space.

(5) Search and planning:- The search and planning component is responsible for exploring the problem space, searching for possible solutions, and planning a sequences of actions to reach the desired goal state. It uses various search algorithms, heuristic methods, and planning teachques to navigate through the problem domain efficiently.

(6) Decision Making:- The decision-making component analysis the available information, evaluates potential solutions, and selects the most appropriate action or plan based on the state.

Ans to the Q no- 4(b)

The depth first search (DFS) strategy has several limitations including

(i) Completeness:- DFS does not guarantee finding a solution if one exists. It may get stuck in an infinite loop if the search space has cycles. To overcome this techniques like cycle detection or iterate deepening can be used.

(ii) Optimal solution:- DFS doesn't guarentee finding the optimal solution. It may find a suboptional solution before exploring the entire search space. To find the optional solution depth first search or using cost functions are required

(iii) Memory usage:- DFS can consume a large amount of memory when traversing deep paths. It stores all visited nodes on the stack ending up stack overflowing.

(iv) Time complexity:- The time complexity of DFS can be high in the worst case scenario particularly when the search space is large and unbounded.

(v) Lack of breadth:- DFS explores a single path in depth before moving to the next branch, potentially neglecting other branches and missing potentially better solutions.

(6) Lack of Information:- DFS does not have information about the entire search space or its structure at the beginning of the search which makes it difficult to make informed decision about which path to explore or prioritize.

(7) No backtracking:- DFS doesn't backtrack automatically. If a path leads to a deadend or an invalid solution, DFS will continue exploring wasting time and resourcing.