National University

Of Computer & Emerging Sciences Faisalabad-Chiniot Campus

AI 2002 Artificial Intelligence

Course Instructor

Ms. Mahzaib Younas

Time allowed = 40 min	Quiz 2	Total Marks = 30

BCS Section E

Roll No	Name	Signature

Question No 01: Choose the correct one. **[6]**

1. Which of the following statements about heuristic functions is FALSE?	**2. In which scenario would Uniform-Cost Search perform worse than Breadth-First Search?**
a) An admissible heuristic never overestimates the true cost to the goal. b) The Manhattan distance heuristic can be used for the 8-puzzle problem. c) Consistent heuristic ensures that estimated cost of a path does not decrease. d) Heuristic that is admissible but not consistent can guarantee optimality in A*.	a) When path costs are significantly varied b) When the search tree has cycles c) When the step costs are uniform d) When the heuristic information is available
3. Which of the following search algorithms is guaranteed to find an optimal solution, provided that all step costs are positive and the heuristic is admissible?	**4. Which search algorithm is best suited for solving problems with infinite state spaces and avoids redundant state exploration?**
a) Depth-First Search b) Greedy Best-First Search c) Iterative Deepening Depth-First Search d) A* Search	a) Depth-First Search b) Breadth-First Search c) Uniform-Cost Search d) Iterative Deepening Search
5. Which of the following search strategies expands the node with the lowest path cost first?	**6. At each iteration of its main loop, A* needs to determine which part of it need to extend.**
a)A* Search b) Best-First Search c) Greedy Best-First Search d) Uniform-Cost Search	a) Paths b) Node c) Route d) Heuristic function

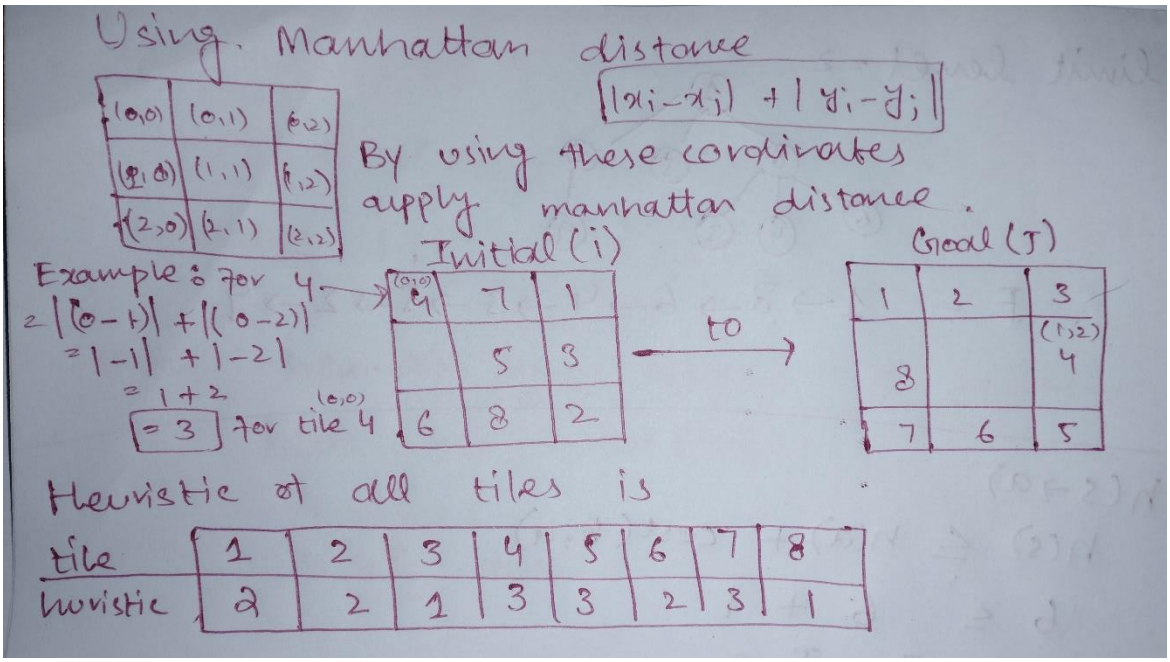
Question no 02: Calculate the heuristic of the given problem. **[4 Marks]**

4	7	1
	5	3
6	8	2

Initial State

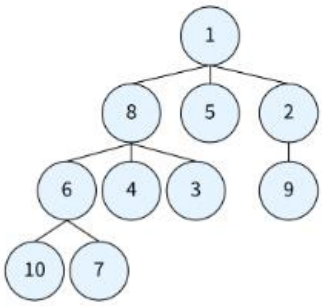
1	2	3
8		4
7	6	5

Goal State

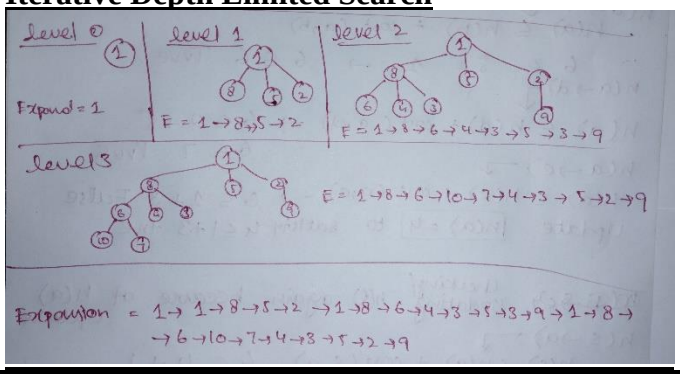


Question No 03: Consider the Graph given below with S = 1as the start state and G = 7 as a goal state, and run the following algorithms. Show the node expansion and also the final path of each search algorithm

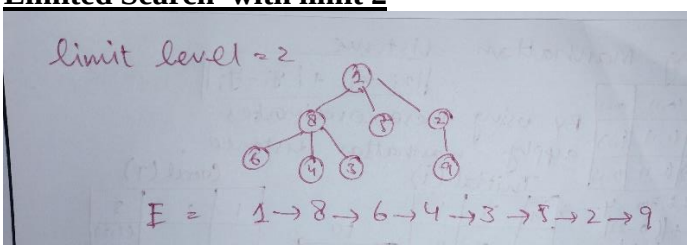
[8 Marks]



Iterative Depth Limited Search



Limited Search with limit 2



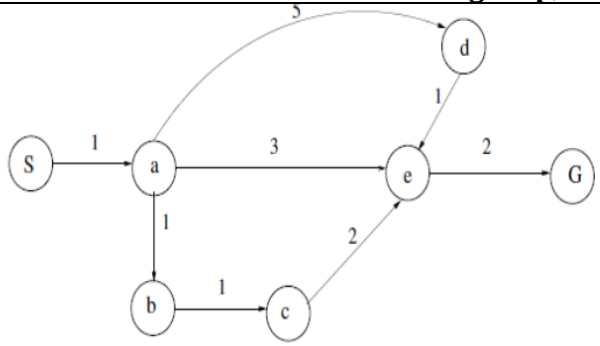
BFS

Node	Open list	Closed list
1	8,5,2	-
8	5,2,6,4,3	1
5	2,6,4,3	1,8
2	6,4,3,9	1,8,5
6	4,3,9,10,7	1,8,5,2
4	3,9,10,7	1,8,5,2,6
3	9,10,7	1,8,5,2,6,4
9	10,7	1,8,5,2,6,4,3
10	10	1,8,5,2,6,4,3,9
7	-	1,8,5,2,6,4,3,910

DFS

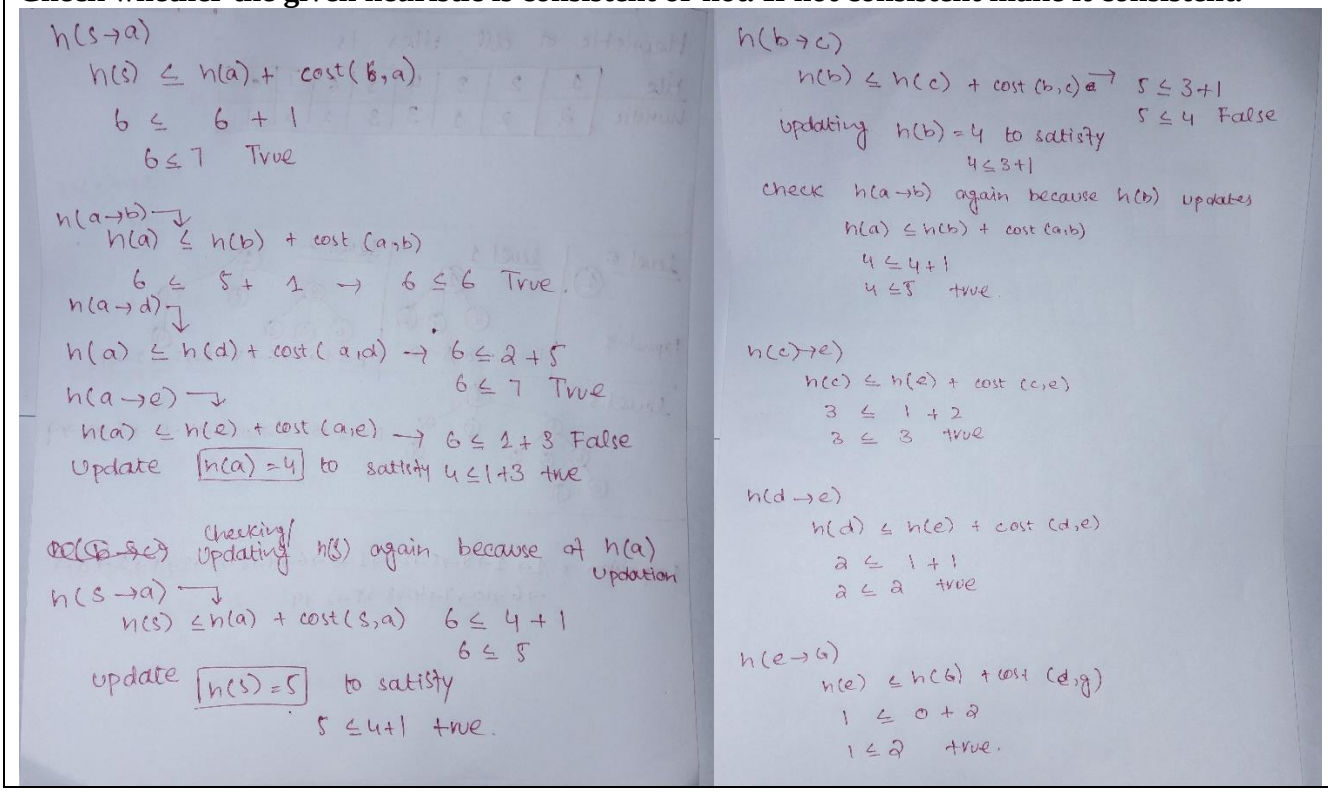
Node	Open list	Closed list
1	8,5,2	-
8	6,4,3,5,2	1
6	10,7,4,3,5,2	1,8
10	7,4,3,5,2	1,8,6
7	4,3,5,2	1,8,6,10
4	3,5,2	1,8,6,10,7
3	5,2	1,8,6,10,7,4
5	2	1,8,6,10,7,4,3
2	9	1,8,6,10,7,4,3,5
9	-	1,8,6,10,7,4,3,5,2

Question No 03: Consider the following map, start is S and goal is G. **[12 Marks]**



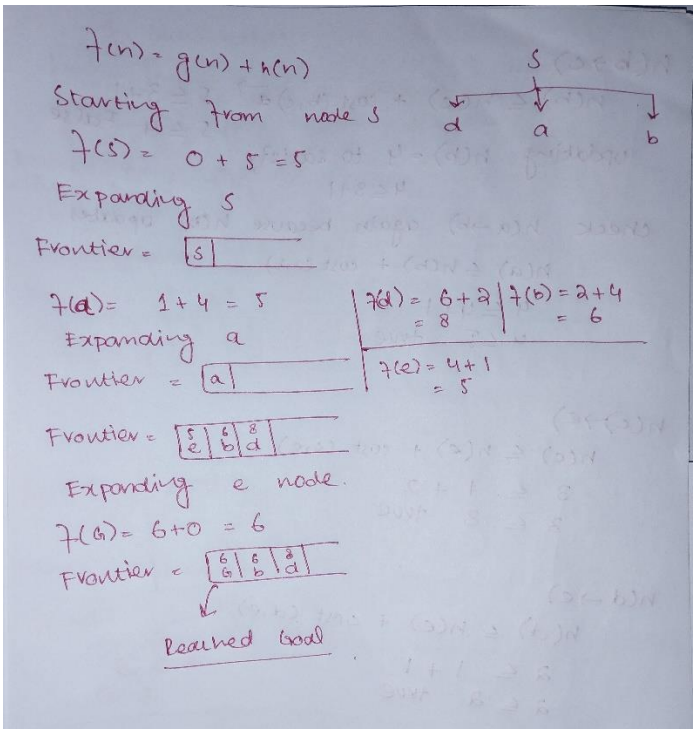
Node	Value
S	6
a	6
b	5
c	3
d	2
e	1
G	0

Check whether the given heuristic is consistent or not. If not consistent make it consistent.



Node	Updated Heuristics
S	5
a	4
b	4
c	3
d	2
e	1
G	0

Apply the A* after updated heuristics with expanded list.



Node	Expanded list (Priority Queue)
S	A
A	5-E, 6-B, 8-D
E	6-G, 6-B, 8-D
G	6-B, 8-D (Goal Reached)