

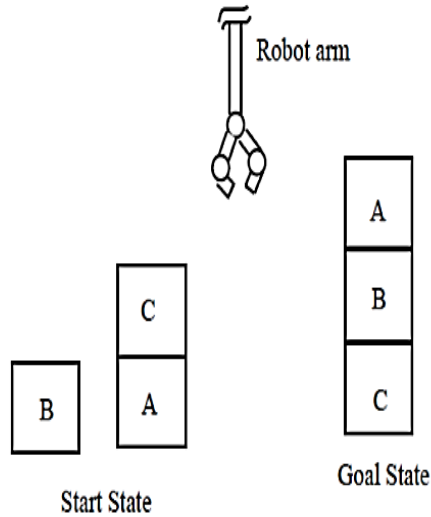
**FUNDAMENTALS OF ARTIFICIAL  
INTELLIGENCE  
Lab Exercise – 4**

**Name : ADVAIT GURUNATH CHAVAN  
Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)**

**CDAC – NOIDA  
PGDAI**

Q1. Given the blocks world indicated in Fig. Solve using Global heuristic function

State space is



Assume that following rules for moves will be followed by the robot arm for carrying out this job:

- **stack(x, y)**: stack block x on block y,
- **lift(x)**: lift-up the block x,
- **putg(x)**: put block x on ground,
- **unstack(x, y)**: unstack block x from block y.

Name : ADVAIT GURUNATH CHAVAN  
Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)

- **Unstack(C, A)** → Lift C from A
- **Putg(C)** → Place C on the ground
- **Lift(A)** → Pick up A
- **Putg(A)** → Place A on the ground
- **Lift(B)** → Pick up B
- **Stack(B, C)** → Place B on top of C
- **Lift(A)** → Pick up A
- **Stack(A, B)** → Place A on top of B

Q2. Solve using A\* Algorithm ()

2	8	3
1	6	4
7		5

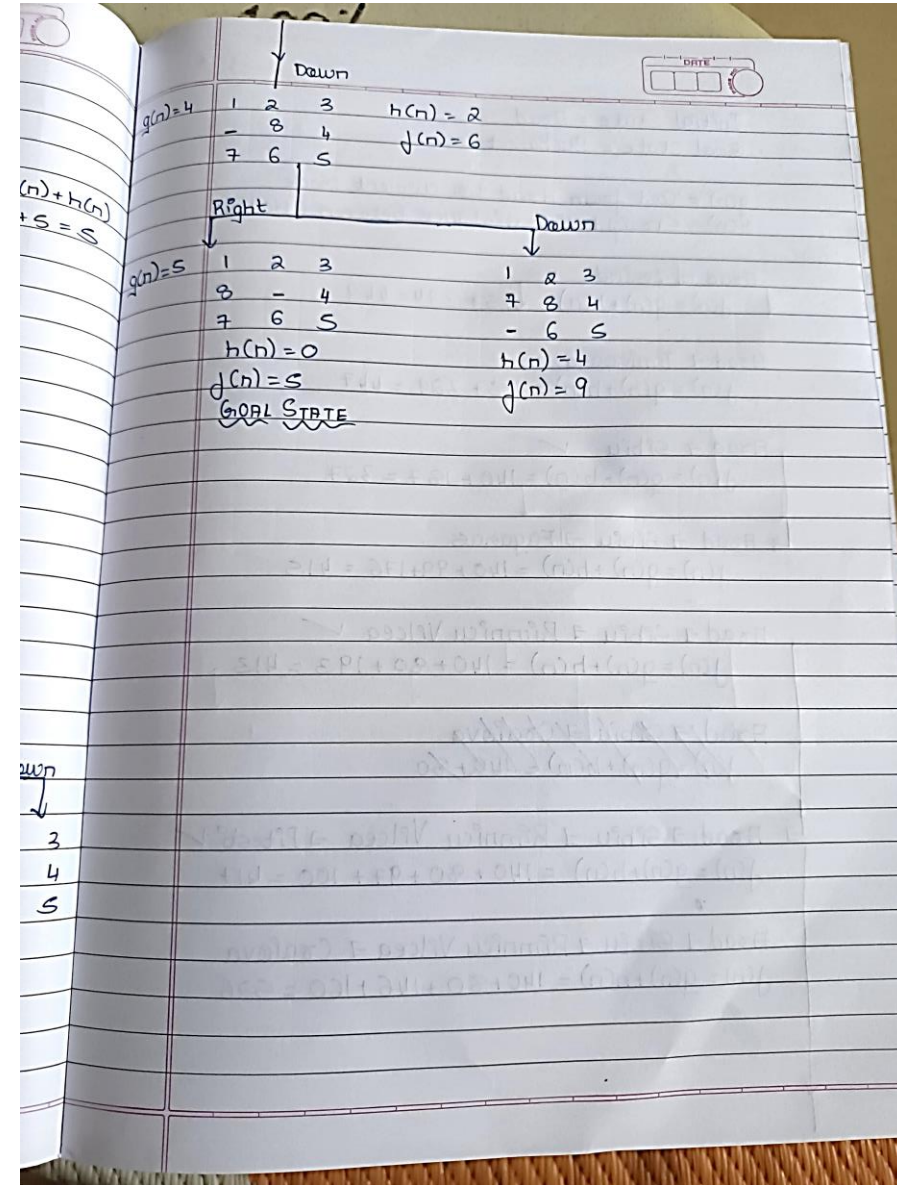
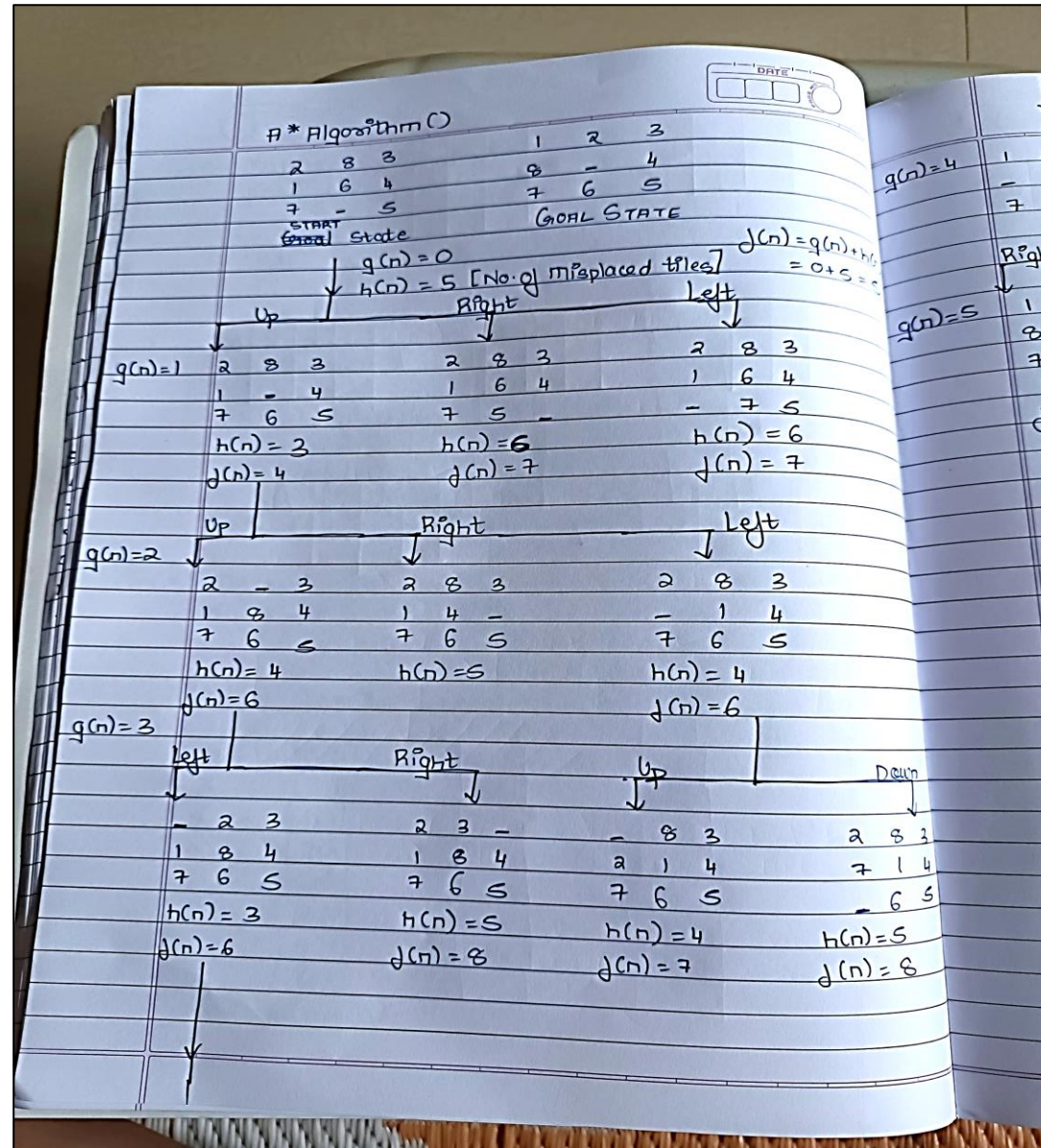
Initial State

1	2	3
8		4
7	6	5

Goal State

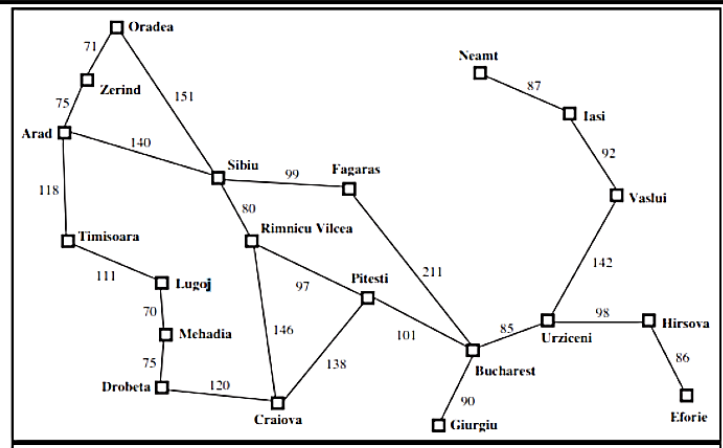
Name : ADVAIT GURUNATH CHAVAN

Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)





Q3. The map of Romania is given. Start node is Arad and Goal node is Bucharest. Find the optimal path using informed search algorithm.



City	Heuristic value	City	Heuristic value
Arad	366	Mehadia	241
Bucharest	0	Neamt	234
Craiova	160	Oradea	380
Eforie	161	Pitesti	100
Fagaras	176	Rimnicu Vilcea	193
Dobreta	242	Timisoara	329
Hirsova	151	Urziceni	80
Iasi	226	Vaslui	199
Lugoj	244	Zerind	374

Sibiu 187

Name : ADVAIT GURUNATH CHAVAN  
Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)

Initial State = Arad  
Goal state = Bucharest

$g(n)$  = Cost from Arad to current Node  
 $h(n)$  = Straight line distance between 2 Nodes.

Arad  $\rightarrow$  Zerind  
 $f(n) = g(n) + h(n) = 75 + 374 = 449$

Arad  $\rightarrow$  Timisoara  
 $f(n) = g(n) + h(n) = 118 + 329 = 447$

Arad  $\rightarrow$  Sibiu ✓  
 $f(n) = g(n) + h(n) = 140 + 187 = 327$

$\rightarrow$  Arad  $\rightarrow$  Sibiu  $\rightarrow$  Fagaras  
 $f(n) = g(n) + h(n) = 140 + 99 + 176 = 415$

Arad  $\rightarrow$  Sibiu  $\rightarrow$  Rimnicu Vilcea ✓  
 $f(n) = g(n) + h(n) = 140 + 80 + 193 = 413$

Arad  $\rightarrow$  Sibiu  $\rightarrow$  Craiova  
 $f(n) = g(n) + h(n) = 140 + 80$

$\rightarrow$  Arad  $\rightarrow$  Sibiu  $\rightarrow$  Rimnicu Vilcea  $\rightarrow$  Pitesti ✓  
 $f(n) = g(n) + h(n) = 140 + 80 + 97 + 100 = 417$

Arad  $\rightarrow$  Sibiu  $\rightarrow$  Rimnicu Vilcea  $\rightarrow$  Craiova  
 $f(n) = g(n) + h(n) = 140 + 80 + 146 + 160 = 526$

$\rightarrow$  Arad  $\rightarrow$  Sibiu  $\rightarrow$  Rimnicu Vilcea  $\rightarrow$  Pitesti  $\rightarrow$  Bucharest  
 $f(n) = 140 + 80 + 97 + 101 + 0 = 418$

3. The optimal path to reach from Arad [Initial state] to Bucharest [Final state], using Informed Search Algorithm is:

Arad  $\rightarrow$  Sibiu  $\rightarrow$  Rimnicu Vilcea  $\rightarrow$  Pitesti  
 $\downarrow$   
Bucharest

Q4. Solve using hill climbing Algorithm

4	3	
6	7	2
8	1	5

(Initial state)

	1	2
3	4	5
6	7	8

(Goal state)

Name : ADVAIT GURUNATH CHAVAN  
Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)

DATE: / /

### Hill Climbing Algorithm

$h \equiv$  No. of misplaced tiles

With each move select the move with less value of  $h$

**Initial State**  
 $h = 9$

**Goal State**

Down Left

4	3	-	4	-	3
6	7	2	6	7	2
8	1	5	8	1	5

$h = 8$   $h = 9$

Down Left

4	3	2	4	3	2
6	7	5	6	-	7
8	1	-	8	1	5

$h = 7$   $h = 8$

Left Up Down Left

4	3	2	4	-	2	4	3	2	4	3	2
6	7	5	6	3	7	6	1	7	-	6	7
8	-	1	8	1	5	8	-	5	8	1	5

$h = 7$   $h = 8$   $h = 8$   $h = 8$



Q4. Solve using hill climbing Algorithm

4	3	
6	7	2
8	1	5

(Initial state)

	1	2
3	4	5
6	7	8

(Goal state)

Name : ADVAIT GURUNATH CHAVAN

Email ID : [advaitchavan135@gmail.com](mailto:advaitchavan135@gmail.com)

