# ASSIGNMENT NO 4

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

Robot arm

Start State

Goal State
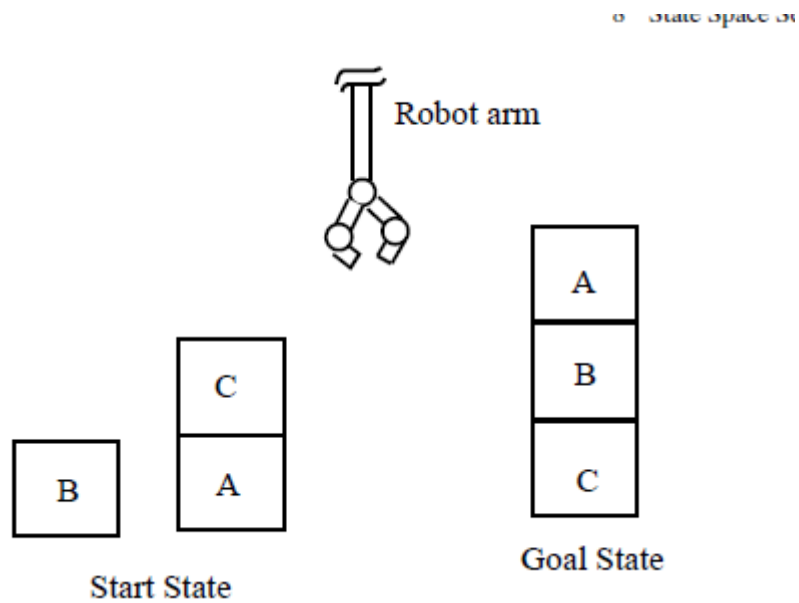
Assume that following rules for moves will be followed by the robot arm for carrying out this job:
• stack(x, y): stack block x on block y,
• lift(x): lift-up the block x,
• putg(x): put block x on ground,
• unstack(x, y): unstack block x from block y.

ANSWER:-

Initial state   Goal state
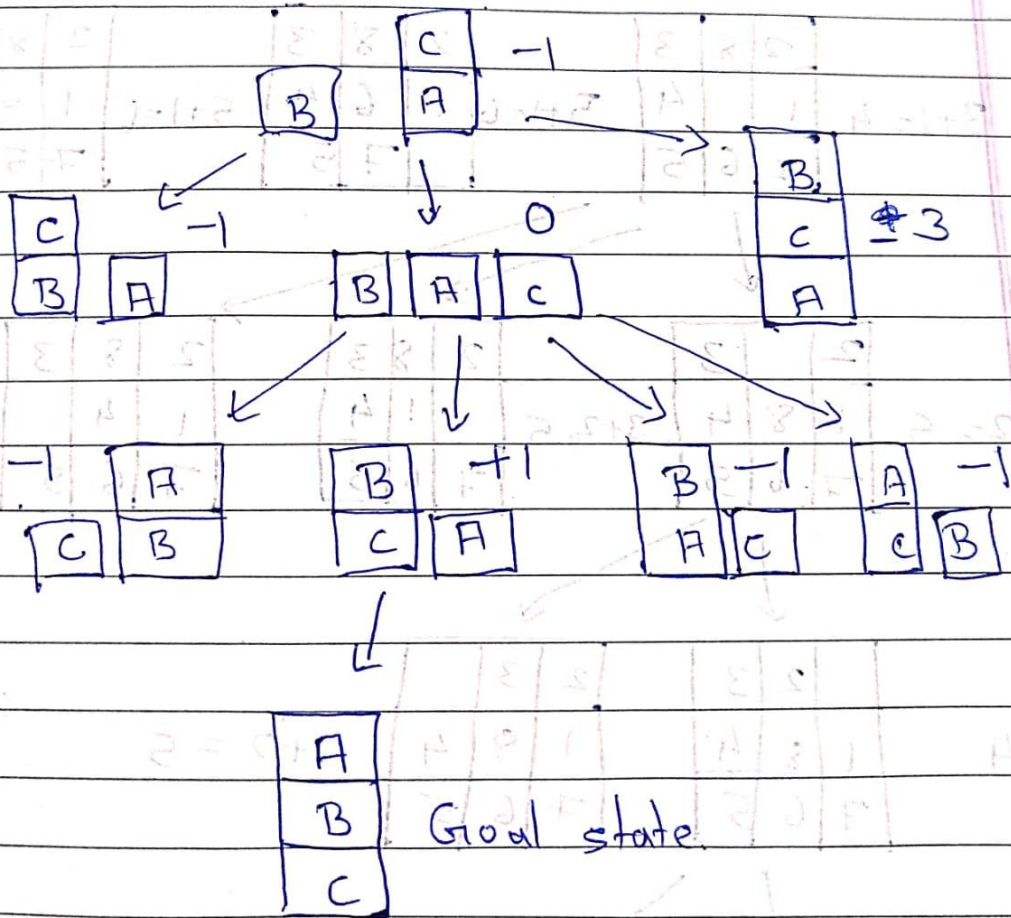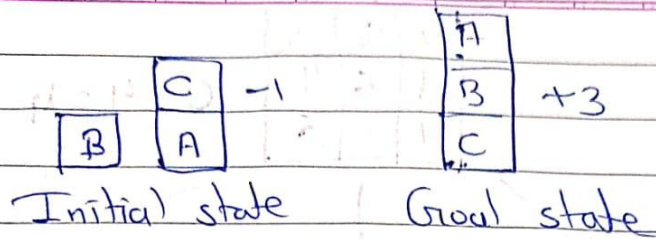
Q2. Solve using A* Algorithm ()

2	8	3
1	6	4
7		5

Initial State

1	2	3
8		4
7	6	5

Goal State

ANSWER:-

(2)

2	8	3
1	6	4
7		5

Initial state

1	2	3
8		4
7	6	5

Goal state
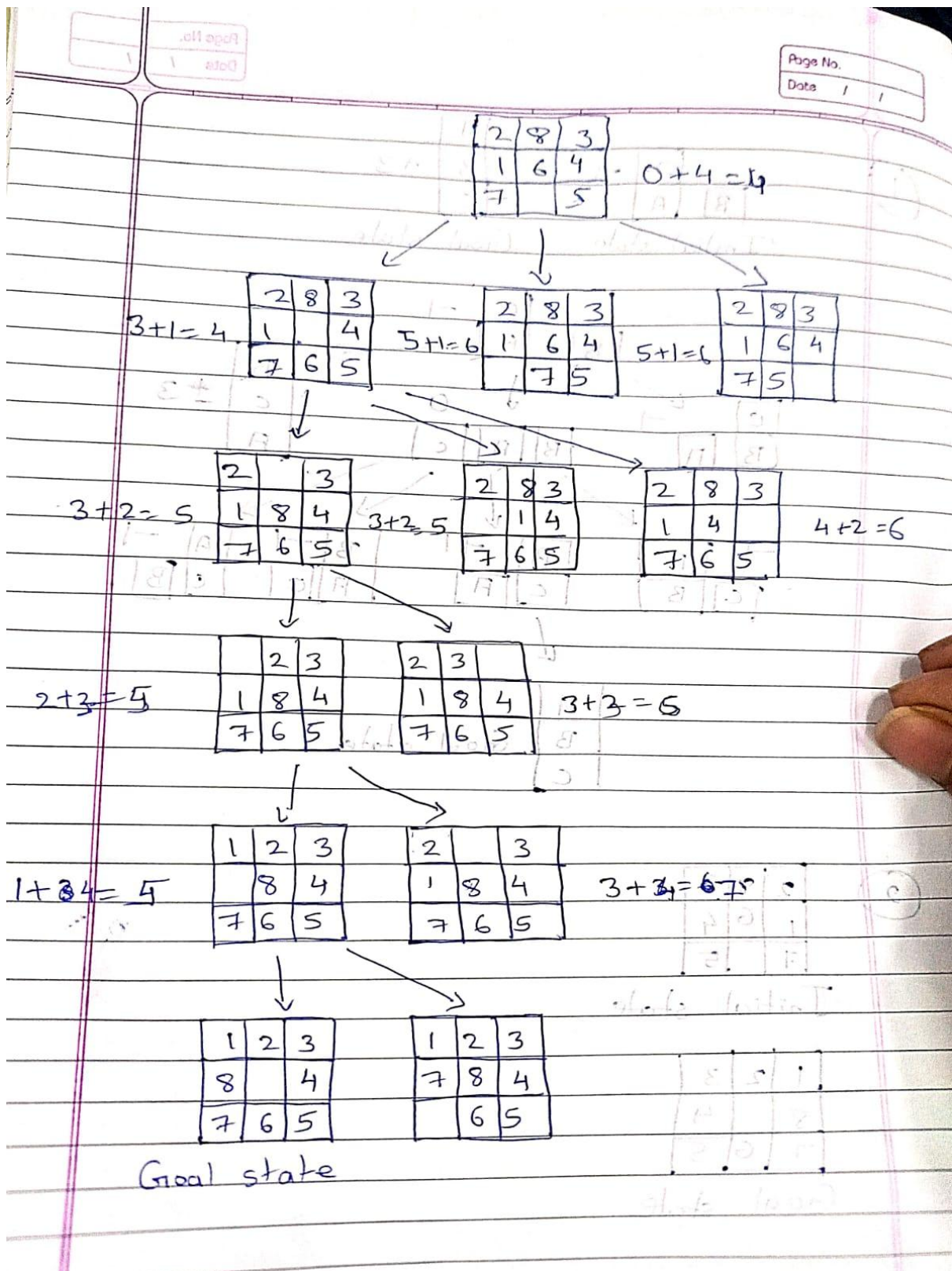
Q3. The map of Romania is given. Start node is Arad and Goal node is Bucharest. Find the optimal path using informed search algorithm.
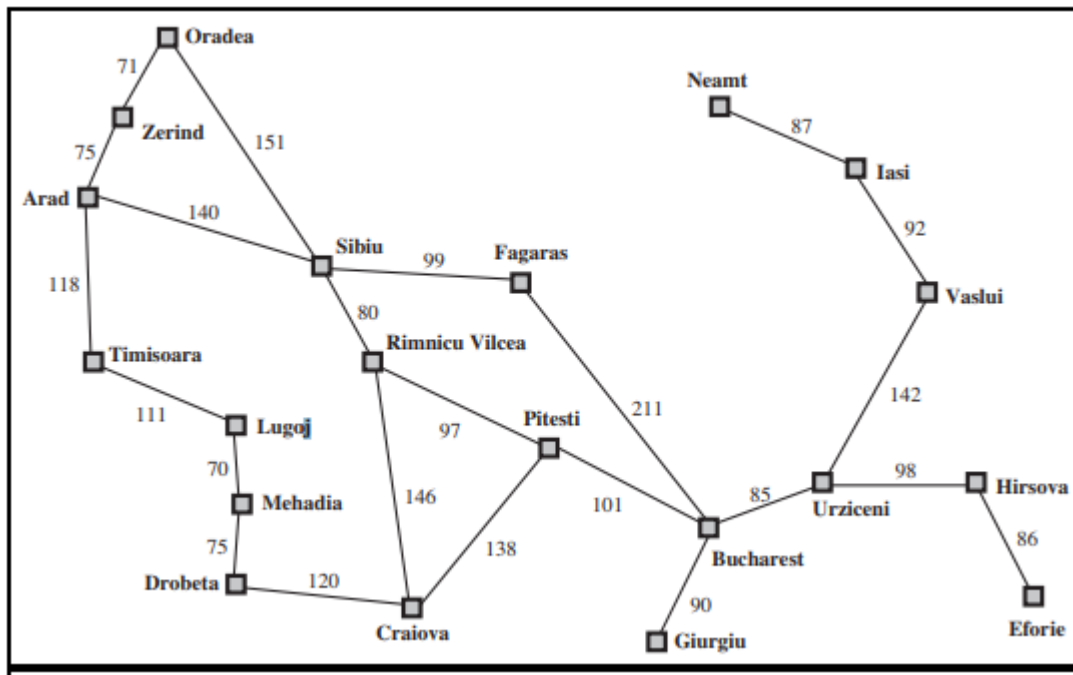
City	Hueristic value	City	Heuristic value
Arad	366	Mehadia	241
Bucharest	0	Neamt	234
Craiova	160	Oradea	380
Eforie	161	Pitesti	100
Fagaras	176	Rimnicu Vilcea	193
Dobreta	242	Timisoara	329
Hirsova	151	Urziceni	80
Iasi	226	Vaslui	199
Lugoj	244	Zerind	374

Sibiu 187

ANSWER:-

Q.3


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                        Arad
            118 /        |        \ 75
           /          140|         \
(447) Timisoara           |          Zerind
                     Sibiu (327)     (449)
              80 /            \ 99
               /               \
  (413) Rimnicu                  Fagaras (415)
        Vilcea    \ 97
        146 /      \
         (526)      Pitest (417)
        Craiova         / 101
                   Bucharest
                   (Goal state)
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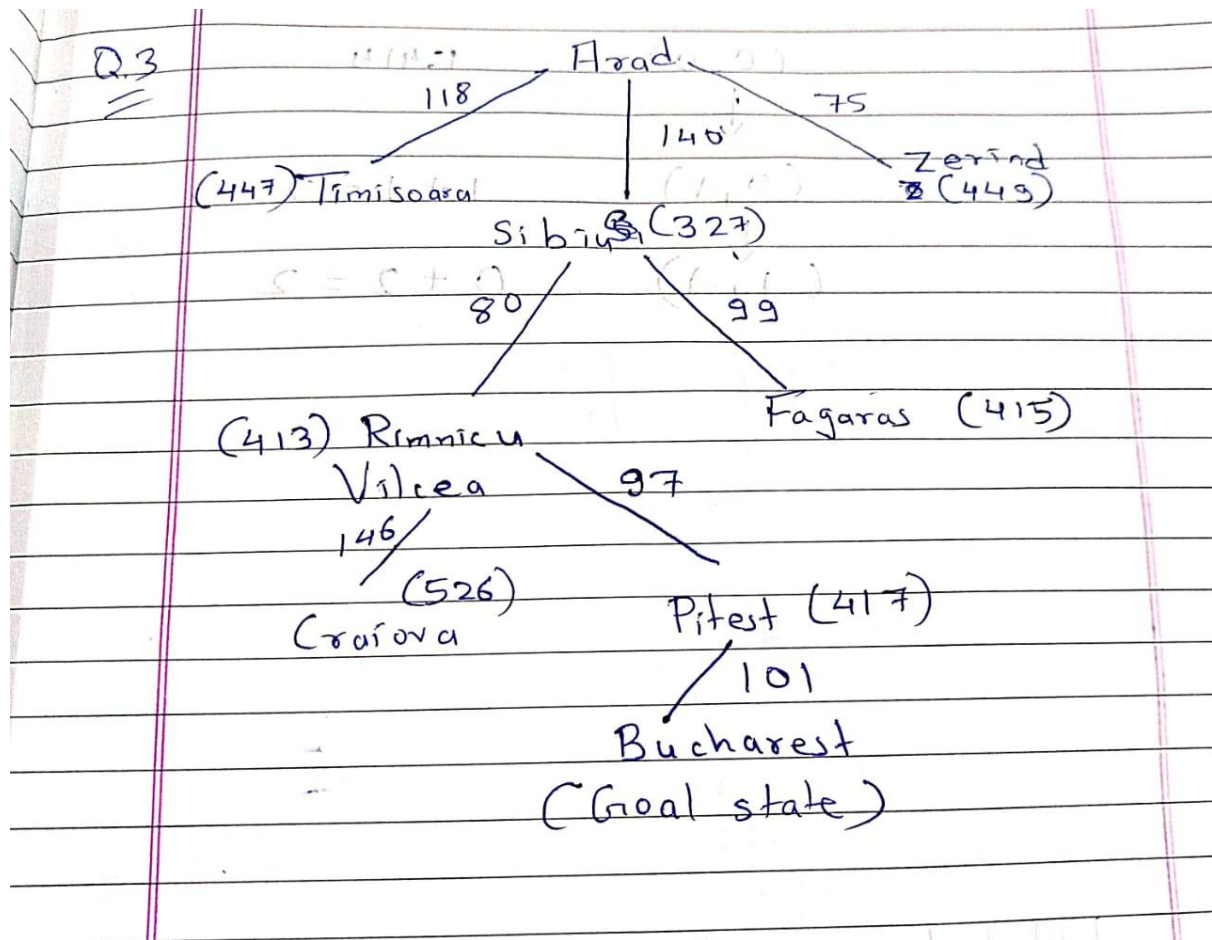
Q4. Solve using hill climbing Algorithm

4	3	
6	7	2
8	1	5

(Initial state)

	1	2
3	4	5
6	7	8

(Goal state)

.

ANSWER:-

Q.4

$8+0=8$

4	3	
6	7	2
8	1	5

(1)

(2)

$8+1=9$

4		3
6	7	2
8	1	5

(3)

4	3	2
6	7	
8	1	5

$7+1=8$

(4)

$7+2=9$

4	3	2
6		7
8	1	5

(5)

4	3	2
6	7	5
8	1	

$6+2=8$

(6)

4	3	2
6	7	5
8		1

$6+3=9$

(7)

$5+4=9$

4	3	2
6		5
8	7	1

(8)

4	3	2
6	7	5
8		1

$6+4=10$

(9)

$5+5=10$

4		2
6	3	5
8	7	1

(10)

4	3	2
	6	5
8	7	1

$5+5=10$

(11)

4	3	2
6		5
8	7	1

$6+5=11$

(12)

$6+6=12$

4	2	
6	3	5
8	7	1

(13)

4	2	
6	3	5
8	7	1

$6+6=12$

Random
choose

4	3	2	(4)
6		7	7 + 2 = 9
8	1	5	

7+3 =10

4		2
6	3	7
8	1	5

7+3=10

4	3	2
	6	7
8	1	5

4	3	2
6	1	7
8		5

7+3=10
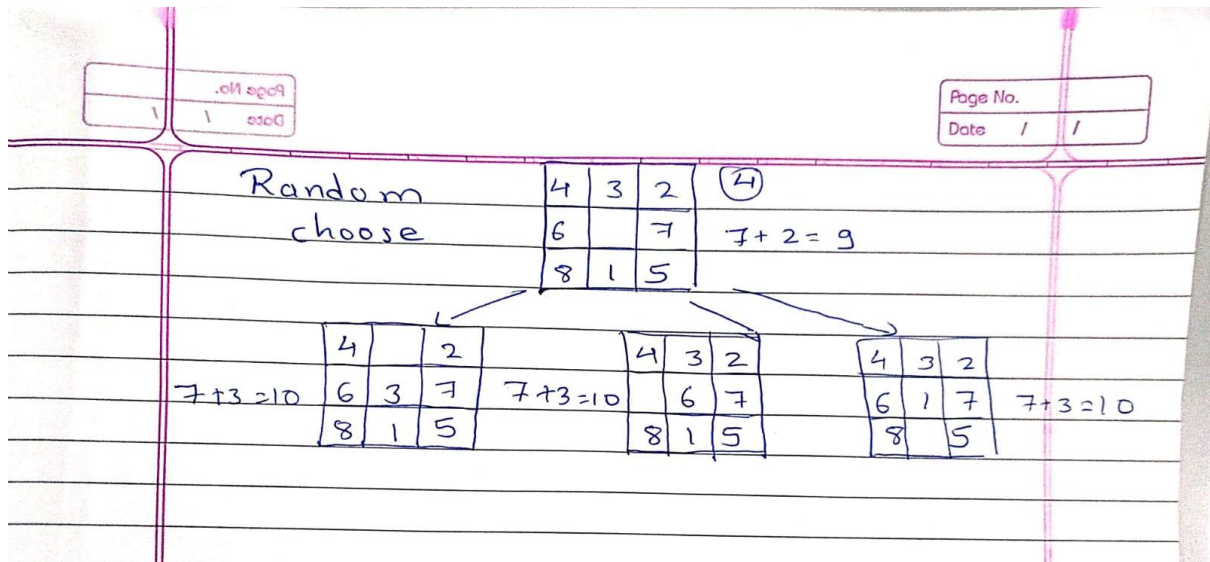
Q5. Robot Path Planning in a Maze

- A robot is placed in a grid maze with obstacles. Start = (0,0), Goal = (n-1,n-1). Use **A*** algorithm with Euclidean distance heuristic to find the shortest path.

ANSWER:-

Q.5

Start $= (0,0)$

Goal $= (n-1, n-1)$

$(0,0)$ and $(n-1, n-1) = \sqrt{(n-1-0)^2 + (n-1-0)^2} = \sqrt{2n^2 - 4n + 2}$

If we take $n = 2$ $= \boxed{\sqrt{2}(n-1)}$

Goal $= (1,1)$

$(0,0) = \sqrt{(1-0)^2 + (1-0)^2} = \sqrt{2} = 1.414$

$(0,1) = \sqrt{(1-0)^2 + (1-1)^2} = \sqrt{1} = 1$

$(1,0) = \sqrt{(1-1)^2 + (1-0)^2} = \sqrt{1} = 1$

$(1,1) = \sqrt{(1-1)^2 + (1-1)^2} = 0$

$(0,0)$ 1.414

$\downarrow$

$(0,1)$ $1 + 1 = 2$

$\downarrow$

$(1,1)$ $0 + 2 = 2$