

ME 8710: Assignment 7

Question 1:

Q1)

A. DFS

| | | | | | | | | | | | | | |
|---|-------|---|---|----|----|----|----|----|--------|----|----|----|----|
| 3 | 2 | | | 10 | | | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 4 | (S) 1 | 7 | 8 | 9 | 11 | 12 | 13 | | | | | | 21 |
| 5 | 6 | | | | | | | | | | | | 22 |
| | | | | | | | | | (G) 31 | 30 | 29 | 28 | 23 |
| | | | | | | | | | | | | | 24 |
| | | | | | | | | | | | 27 | 26 | 25 |

Number of Steps: 21

Total Number of Nodes: 31

B. BFS

| | | | | | | | | | | | | | |
|----|-------|----|----|----|----|----|----|----|--------|----|----|----|----|
| 6 | 2 | | | 10 | | | 17 | 21 | 26 | 30 | 34 | 38 | 42 |
| 5 | (S) 1 | 3 | 7 | 9 | 11 | 13 | 15 | 18 | 22 | 27 | 31 | 35 | 39 |
| 8 | 4 | | | | | | 19 | | | | | | 43 |
| | | | | | | | 23 | | (G) 46 | | | | 45 |
| 41 | | | | 16 | | | | | 44 | | | | |
| 37 | 33 | 29 | 25 | 20 | 24 | 28 | 32 | 36 | 40 | | | | |

Number of Steps: 15

Total Number of Nodes: 46

C. A*

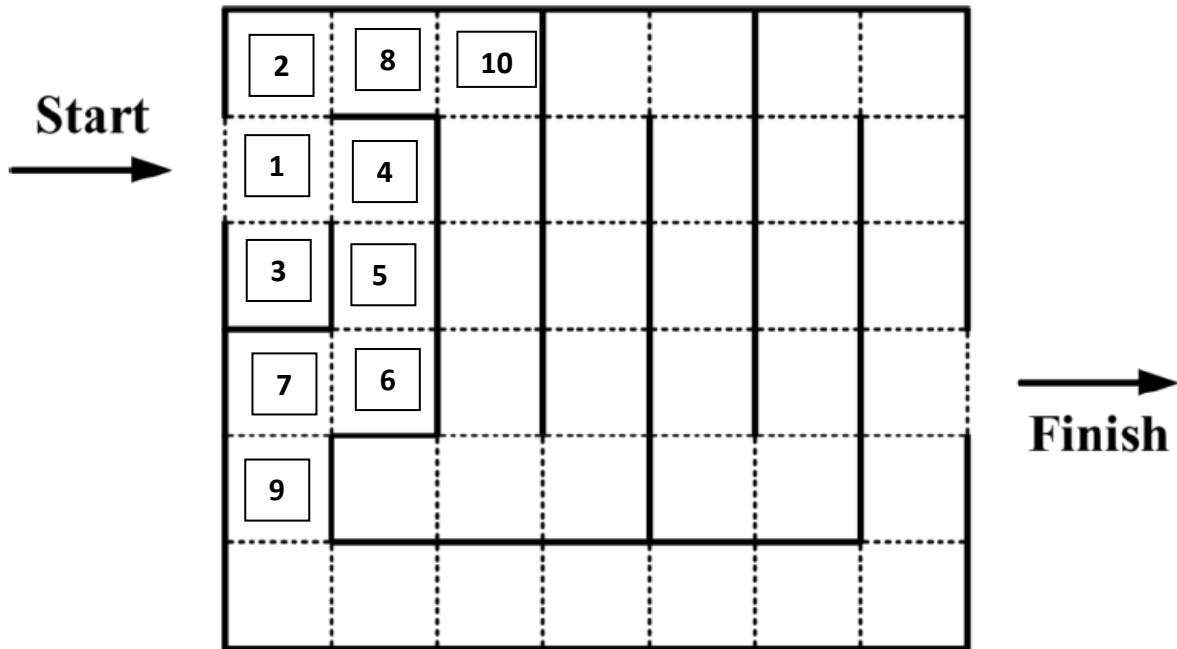
| | | | | | | | | | | | | | |
|---|-------|---|----|----|----|----|----|----|--------|----|----|----|--|
| | 2 | | | 9 | | | 16 | 19 | 22 | 26 | 30 | | |
| 5 | (S) 1 | 3 | 6 | 8 | 10 | 12 | 14 | 17 | 20 | 23 | 27 | 31 | |
| 7 | 4 | | | | | | 18 | | | | | | |
| | | | | | | | 21 | | (G) 37 | | | | |
| | | | | 15 | | | | | 36 | | | | |
| | | | 29 | 25 | 28 | 32 | 33 | 34 | 35 | | | | |

Number of Steps: 15

Total Number of Nodes: 37

| node | g(n) | horizontal cells | vertical cells | h(n) | f(n) | |
|------|------|------------------|----------------|--------|--------|-------------------------|
| 1 | 0 | 8 | 2 | 9.998 | 9.998 | expand to node 2,3,4,5 |
| 2 | 1 | 8 | 3 | 10.997 | 11.997 | expand to node 24 |
| 3 | 1 | 7 | 2 | 8.998 | 9.998 | expand to node 6 |
| 4 | 1 | 8 | 1 | 8.999 | 9.999 | expand to node 7 |
| 5 | 1 | 9 | 2 | 10.998 | 11.998 | |
| 6 | 2 | 6 | 2 | 7.998 | 9.998 | expand to node 8 |
| 7 | 2 | 9 | 1 | 9.999 | 11.999 | |
| 8 | 3 | 5 | 2 | 6.998 | 9.998 | expand to node 9,10,11 |
| 9 | 4 | 5 | 3 | 7.997 | 11.997 | |
| 10 | 4 | 4 | 2 | 5.998 | 9.998 | expand to node 12 |
| 11 | 4 | 5 | 1 | 5.999 | 9.999 | expand to node 13 |
| 12 | 5 | 3 | 2 | 4.998 | 9.998 | expand to node 14 |
| 13 | 5 | 5 | 0 | 5.000 | 10.000 | expand to node 15 |
| 14 | 6 | 2 | 2 | 3.998 | 9.998 | expand to node 16,17,18 |
| 15 | 6 | 5 | 1 | 5.999 | 11.999 | expand to node 25 |
| 16 | 7 | 2 | 3 | 4.997 | 11.997 | |
| 17 | 7 | 1 | 2 | 2.998 | 9.998 | expand to node 19,20 |
| 18 | 7 | 2 | 1 | 2.999 | 9.999 | expand to node 21 |
| 19 | 8 | 1 | 3 | 3.997 | 11.997 | |
| 20 | 8 | 0 | 2 | 1.998 | 9.998 | expand to node 22,23 |
| 21 | 8 | 2 | 0 | 2.000 | 10.000 | |
| 22 | 9 | 0 | 3 | 2.997 | 11.997 | expand to node 26 |
| 23 | 9 | 1 | 2 | 2.998 | 11.998 | expand to node 27 |
| 24 | 2 | 9 | 3 | 11.997 | 13.997 | |
| 25 | 7 | 5 | 2 | 6.998 | 13.998 | expand to node 28,29 |
| 26 | 10 | 1 | 3 | 3.997 | 13.997 | expand to node 30 |
| 27 | 10 | 2 | 2 | 3.998 | 13.998 | expand to node 31 |
| 28 | 8 | 4 | 2 | 5.998 | 13.998 | expand to node 32 |
| 29 | 8 | 6 | 2 | 7.998 | 15.998 | |
| 30 | 11 | 2 | 3 | 4.997 | 15.997 | |
| 31 | 11 | 3 | 2 | 4.998 | 15.998 | |
| 32 | 9 | 3 | 2 | 4.998 | 13.998 | expand to node 33 |
| 33 | 10 | 2 | 2 | 3.998 | 13.998 | expand to node 34 |
| 34 | 11 | 1 | 2 | 2.998 | 13.998 | expand to node 35 |
| 35 | 12 | 0 | 2 | 1.998 | 13.998 | expand to node 36 |
| 36 | 13 | 0 | 1 | 0.999 | 13.999 | expand to node 37 |
| 37 | 14 | 0 | 0 | 0.000 | 14.000 | solution reached |

Q2)



a). A* will guarantee the solution for the above problem.

| node | $g(n)$ | horizontal cells | vertical cells | $h(n)$ | $f(n)$ | |
|------|--------|------------------|----------------|--------|--------|----------------------|
| 1 | 0 | 6 | 2 | 8.000 | 8.000 | expand to node 2,3,4 |
| 2 | 1 | 6 | 3 | 9.000 | 10.000 | expand to node 8 |
| 3 | 1 | 6 | 1 | 7.000 | 8.000 | x |
| 4 | 1 | 5 | 2 | 7.000 | 8.000 | expand to node 5 |
| 5 | 2 | 5 | 1 | 6.000 | 8.000 | expand to node 6 |
| 6 | 3 | 5 | 0 | 5.000 | 8.000 | expand to node 7 |
| 7 | 4 | 6 | 0 | 6.000 | 10.000 | expand to node 9 |
| 8 | 2 | 5 | 3 | 8.000 | 10.000 | expand to node 10 |
| 9 | 5 | 6 | 1 | 7.000 | 12.000 | |
| 10 | 3 | 4 | 3 | 7.000 | 10.000 | |