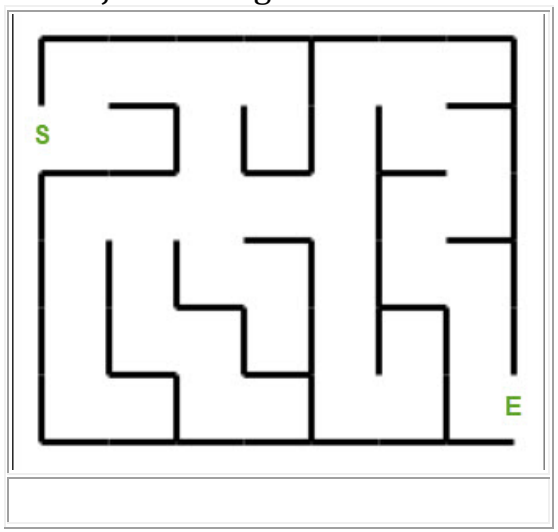
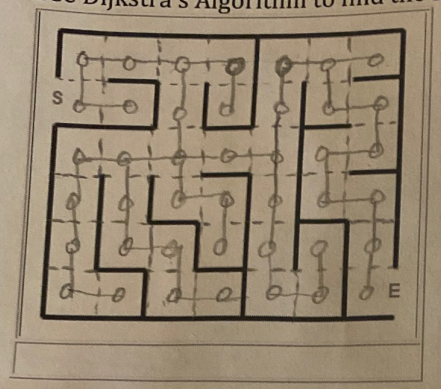
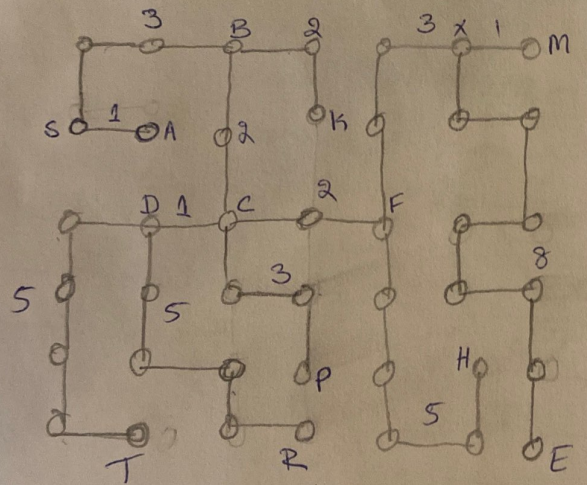
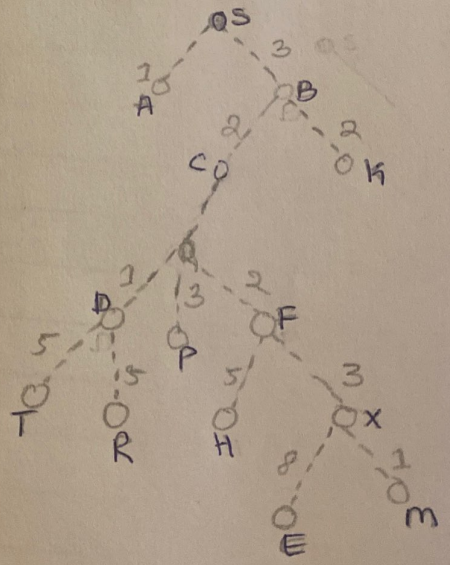
Use Dijkstra's Algorithm to find the shortest path of the the following maze .

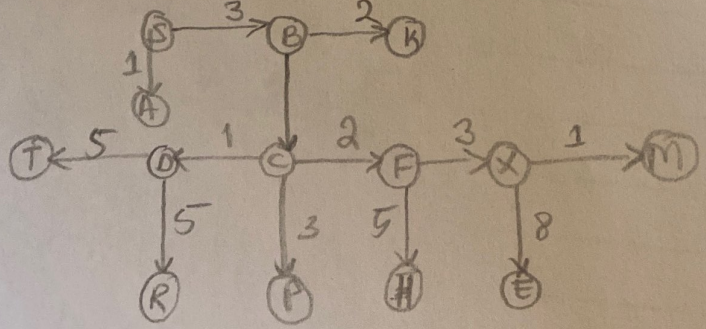


Use Dijkstra's Algorithm to find the shortest path of the the following maze . . .









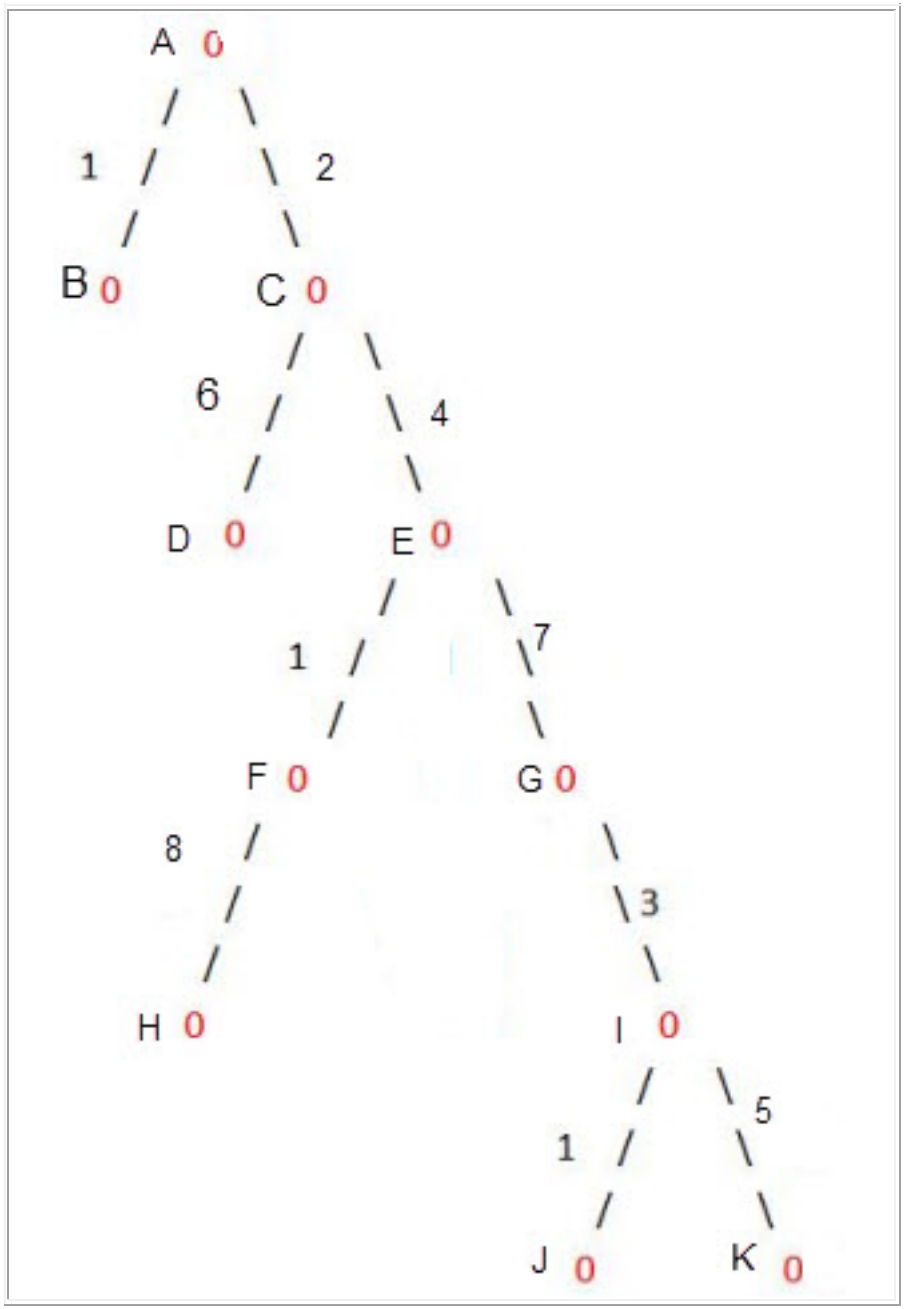
Vertex (accumulated path)	Initial Next Step S	Step1 S Next Step B	Step2 (S, B) Next Step C	Step3(S, B,C) Next Step D	Step4(S, B,C,D) Next Step F	Step5(S, B,C,D,F) Next Step X	Step6(S, B,C,D,F,X) Next Step E	Step7(S, B,C,D,F,X,E)
S	0	0	0	0	0	0	0	0
B	∞	3	3	3	3	3	4	4
A	∞	1	1	1	1	1	1	1
C	∞	∞	5	5	5	5	5	5
K	∞	∞	5	5	5	5	5	5
P	∞	∞	∞	8	8	8	8	8
D	∞	∞	∞	6	6	6	6	6
F	∞	∞	∞	7	7	7	7	7

R	∞	∞	∞	∞	11	11	11	11
T	∞	∞	∞	∞	11	11	11	11
H	∞	∞	∞	∞	∞	12	12	12
X	∞	∞	∞	∞	∞	10	10	10
M	∞	∞	∞	∞	∞	∞	11	11
E	∞	∞	∞	∞	∞	∞	18	18

- V: the current visiting node
- V: the next node to visit
- V: this node has been visited

Stop if the destination node E is reached
you will find the minimum distance of **E** from **S** is **18**. The path is **S>B>C>D>F>X>E**

- Process
  - Step 1: Applying Dijkstra's Algorithm to find the shortest path. Your answer should include
    - Each node of the tree representation of the maze should be labeled sequentially and each edge should have a number indicating the distance. For example,


A 0
1
2
B 0
C 0
6
4
D 0
E 0
1
7
F 0
G 0
8
3
H 0
I 0
1
5
J 0
K 0

- Your answer should include the path and the total distance.
- References
  - Maze
  - Shortest Path

Solution:

Vertex (accumulate path	Initial Next Step (A)	Step1 (A)	Step2 (B)	Step3 (C)	Step4 (E)	Step5 (F)	Step6 (D)	Step7 (G)	Step8 (H)	Step9 (I)	Step10 (J)
A	0	0	0	0	0	0	0	0	0	0	0
B	∞	1	1	1	1	1	1	1	1	1	1
C	∞	2	2	2	2	2	2	2	2	2	2
D	∞	∞	∞	8	8	8	8	8	8	8	8
E	∞	∞	∞	6	6	6	6	6	6	6	6
F	∞	∞	∞	∞	7	7	7	7	7	7	7
H	∞	∞	∞	∞	∞	15	15	15	15	15	15
G	∞	∞	∞	∞	13	13	13	13	13	13	13
I	∞	∞	∞	∞	∞	∞	∞	16	16	16	16
J	∞	∞	∞	∞	∞	∞	∞	∞	∞	17	17

K	∞	∞	∞	∞	∞	∞	∞	∞	∞	21	21

- Let's consider A and K as the start and destination vertex respectively

Initially, all the vertices except the start vertex A are marked by ∞ and the start vertex A is marked by 0

Note:

- Initial
  - 0 is smallest cost on Initial step.
    - Thus, A is selected as the starting point for Step 1.
- Step 1
  - A is selected as the starting point for Step 1.
    - From A one can go to A or B or C
      - The accumulated cost on A is not changed. It is still 0.
      - The accumulated cost on B is 1.
      - The accumulated cost on C is 2.
      - 1 is smaller than 2.
        - Thus, B is selected as the starting point for Step 2.
- Step 2
  - B is selected as the starting point for Step 2.
    - From B there is no path so all the values will remain the same
      - Since B is already visited, will select C as the starting point for Step3.
- Step 3
  - C is selected as the starting point for Step 3.
    - From C one can go D or E
      - The accumulated cost on C is not changed. It is still 2.
      - The accumulated cost on D is 8.
      - The accumulated cost on E is 6.
      - 6 is smaller than 8.
        - Thus, E is selected as the starting point for Step 4.

- Step 4
  - E is selected as the starting point for Step 4.
    - From E one can go F or G
      - The accumulated cost on E is not changed. It is still 6.
      - The accumulated cost on F is 8.
      - The accumulated cost on E is 13.
      - 8 is smaller than 13.
        - Thus, F is selected as the starting point for Step 5.
- Step 5
  - F is selected as the starting point for Step 5.
    - From F one can go H
      - The accumulated cost on F is not changed. It is still 7.
      - The accumulated cost on H is 15.
      - A, B, C, E and F already visited vertices, the remaining vertices are D and G.
      - The accumulated cost on D is 8.
      - The accumulated cost on G is 13.
      - 8 is smaller than 13 and 15.
        - Thus, D is selected as the starting point for Step 6.
- Step 6
  - D is selected as the starting point for Step 6.
    - From D one can go nowhere, there is no path connected to D
      - The accumulated cost on D is not changed. It is still 8.
      - All the values will remain the same for visited vertices.
      - A, B, C, D, E and F already visited vertices, the remaining vertices are H and G.
      - The accumulated cost on H is 15.
      - The accumulated cost on G is 13.
      - 13 is smaller than 15.
        - Thus, G is selected as the starting point for Step 7.
- Step 7
  - G is selected as the starting point for Step 7.
    - From G one can go I

        - The accumulated cost on G is not changed. It is still 13.
        - All the values will remain the same for visited vertices.
        - The accumulated cost on I is 16.
        - A, B, C, D, E, F and G are the vertices already visited, the remaining vertices are I and H
        - The accumulated cost on H is 15.
        - 15 is smaller than 16.
            - Thus, H is selected as the starting point for Step 8 .

- Step 8
    - H is selected as the starting point for Step 8.
        - From H one can go nowhere, there is no path connected to H
            - the accumulated cost on His not changed. It is still 15.
            - All the values will remain the same for visited vertices.
            - A, B, C, D, E, F, G and H already visited vertices, the remaining vertices are I, J and K.
            - The accumulated cost on I is 16.
            - the accumulated cost on J amd K is still infinity.
                - Thus, I is selected as the starting point for Step 9.
- Step 9
    - I is selected as the starting point for Step 9.
        - From I one can go to J or K, where K is the destination
            - the accumulated cost on I is not changed. It is still 16.
            - All the values will remain the same for visited vertices.
            - A, B, C, D, E, F, G, H and I already visited vertices, the remaining vertices are J and K, where K is the destination so will visit J and stop on K.
            - the accumulated cost on J is 17.
            - the accumulated cost on K is 21.

- Thus, J is selected as the starting point for Step 10 and after this stop at Kth is reached because K is the destination.

You will find the minimum distance of K from ***A*** is ***21*** And the path is

2→ 4→ 7→ 3→ 5→ 9