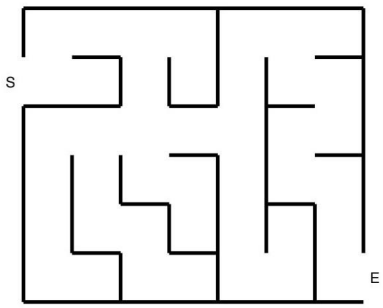


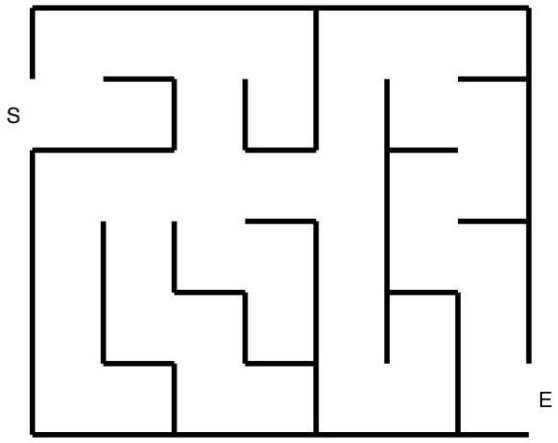
Use Prim's Minimum Spanning Tree algorithm and Kruskal's Minimum Spanning Tree algorithm to find the shortest path of a maze.

Step 1: Similar to the previous question of finding the shortest path of the a maze. But instead of using Dijkstra's Algorithm, you will use Minimum Spanning Tree Algorithm.

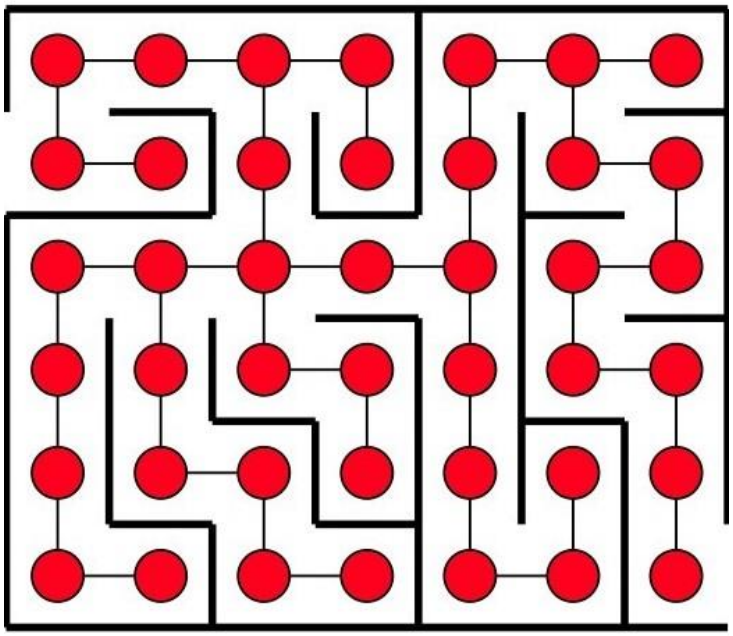
Step 2: Comparing the performance of these two algorithm in solving this question by Big-O comparison

Ans:

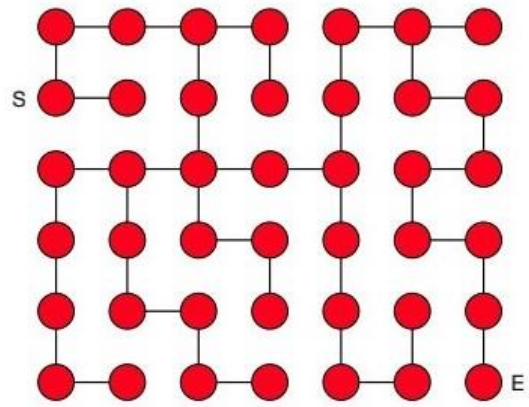
Step 1:



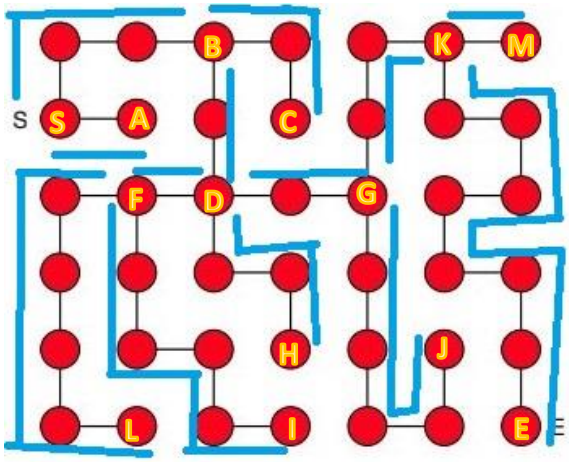
Step 2:



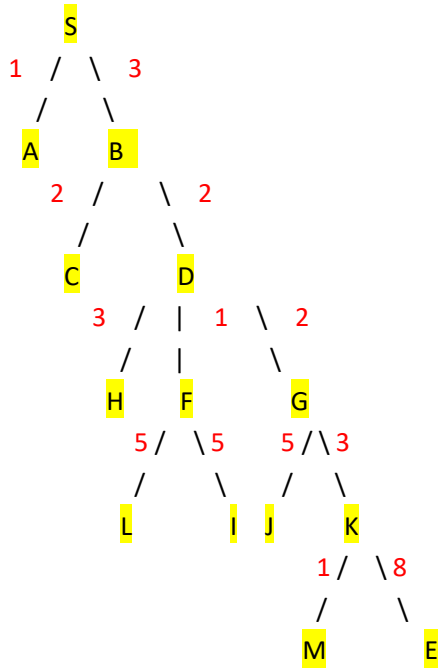
Step 3:



Step4:



Step 5:



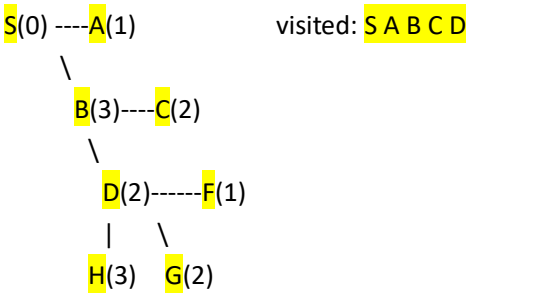
Prim's Minimum Spanning Tree algorithm：

S(0) ----A(1) visited: S
  \
  B(3)

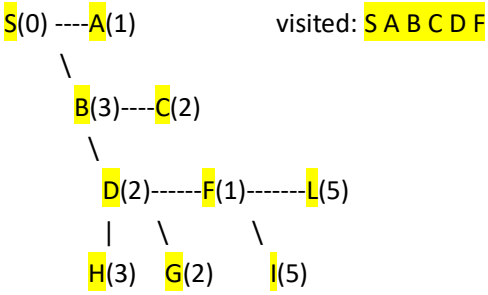
S(0) ----A(1) visited: S A
  \
  B(3)

S(0) ----A(1) visited: S A B
  \
  B(3)----C(2)
    \
    D(2)

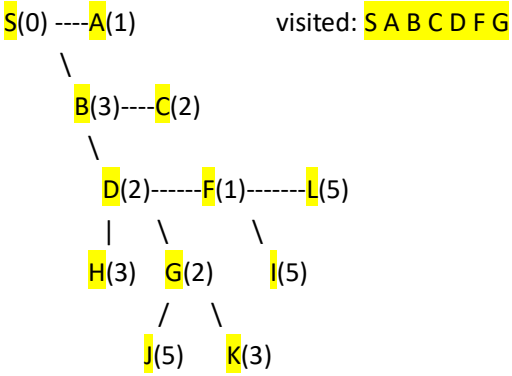
S(0) ----A(1) visited: S A B C
  \
  B(3)----C(2)
    \
    D(2)



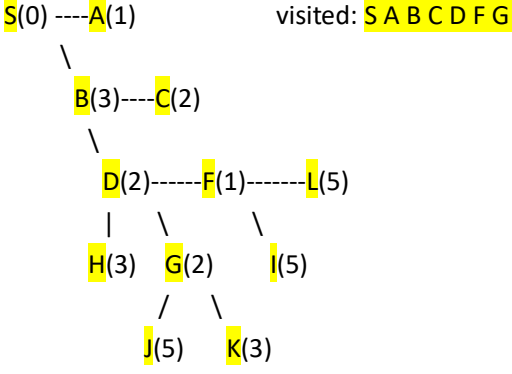
visited: S A B C D



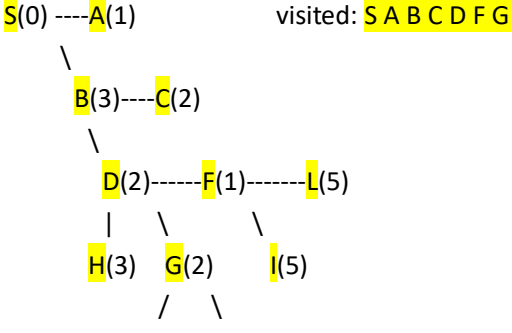
visited: S A B C D F



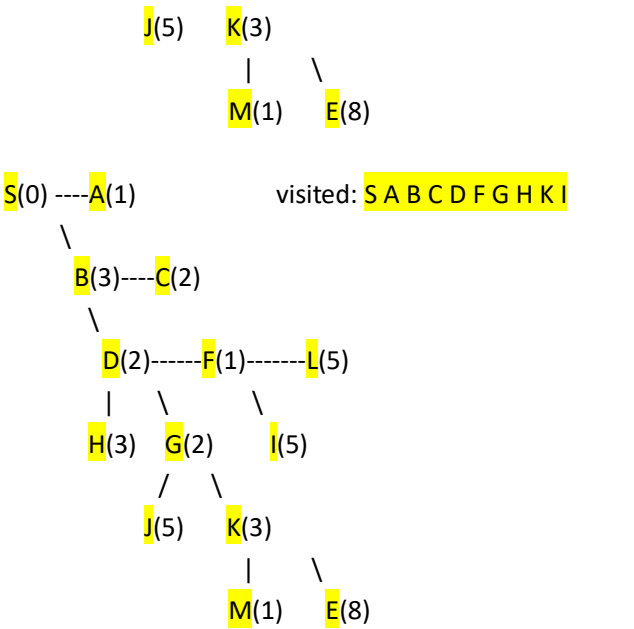
visited: S A B C D F G

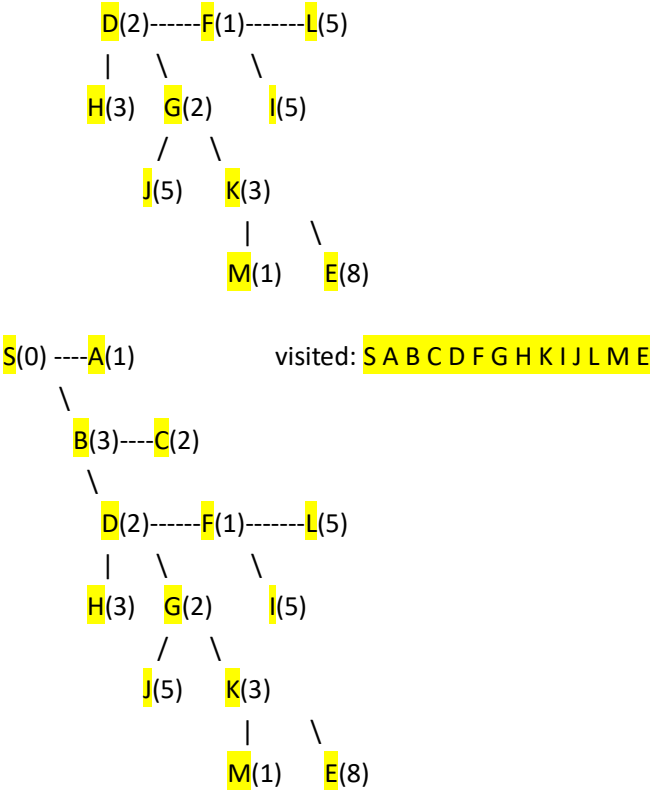


visited: S A B C D F G H



visited: S A B C D F G H K


J(5) K(3)
| \
M(1) E(8)
S(0) ----A(1) visited: S A B C D F G H K I
\
B(3)----C(2)
\
D(2)------F(1)-------L(5)
| \ \
H(3) G(2) I(5)
/ \
J(5) K(3)
| \
M(1) E(8)
S(0) ----A(1) visited: S A B C D F G H K I J
\
B(3)----C(2)
\
D(2)------F(1)-------L(5)
| \ \
H(3) G(2) I(5)
/ \
J(5) K(3)
| \
M(1) E(8)
S(0) ----A(1) visited: S A B C D F G H K I J L
\
B(3)----C(2)
\
D(2)------F(1)-------L(5)
| \ \
H(3) G(2) I(5)
/ \
J(5) K(3)
| \
M(1) E(8)
S(0) ----A(1) visited: S A B C D F G H K I J L M
\
B(3)----C(2)
\



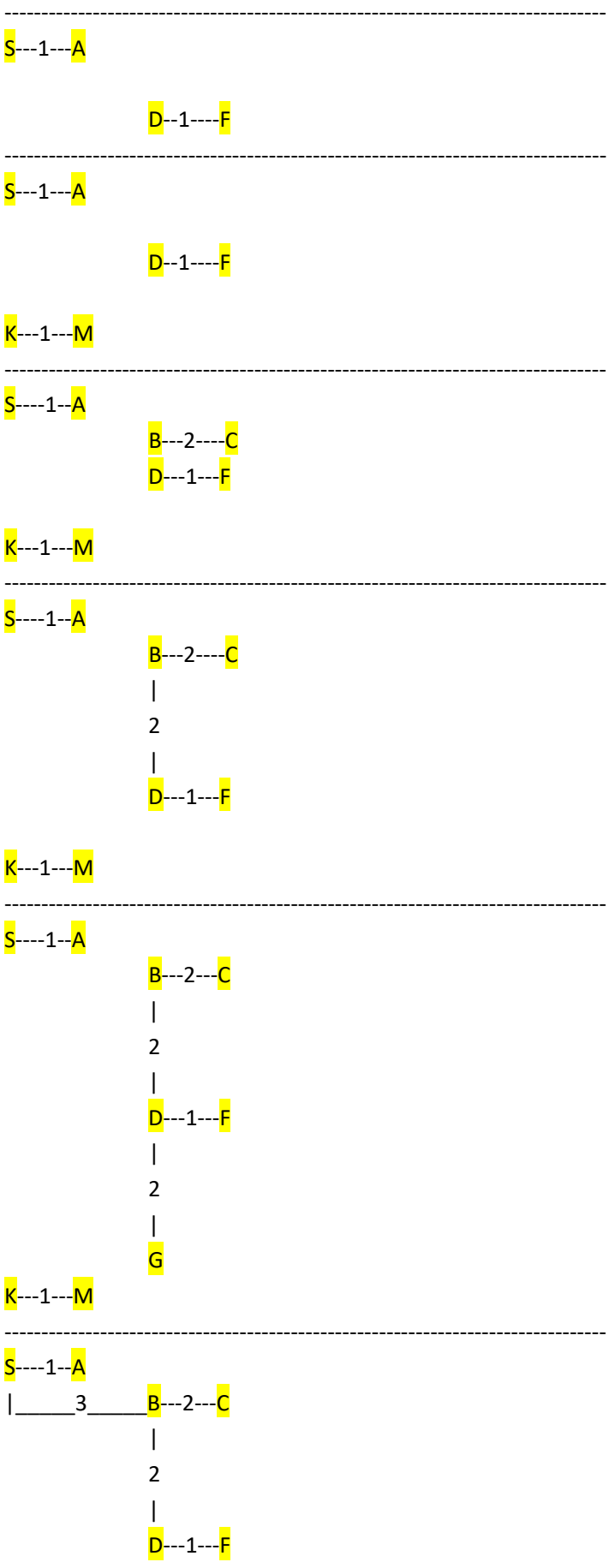
The shortest path from S to E is 18

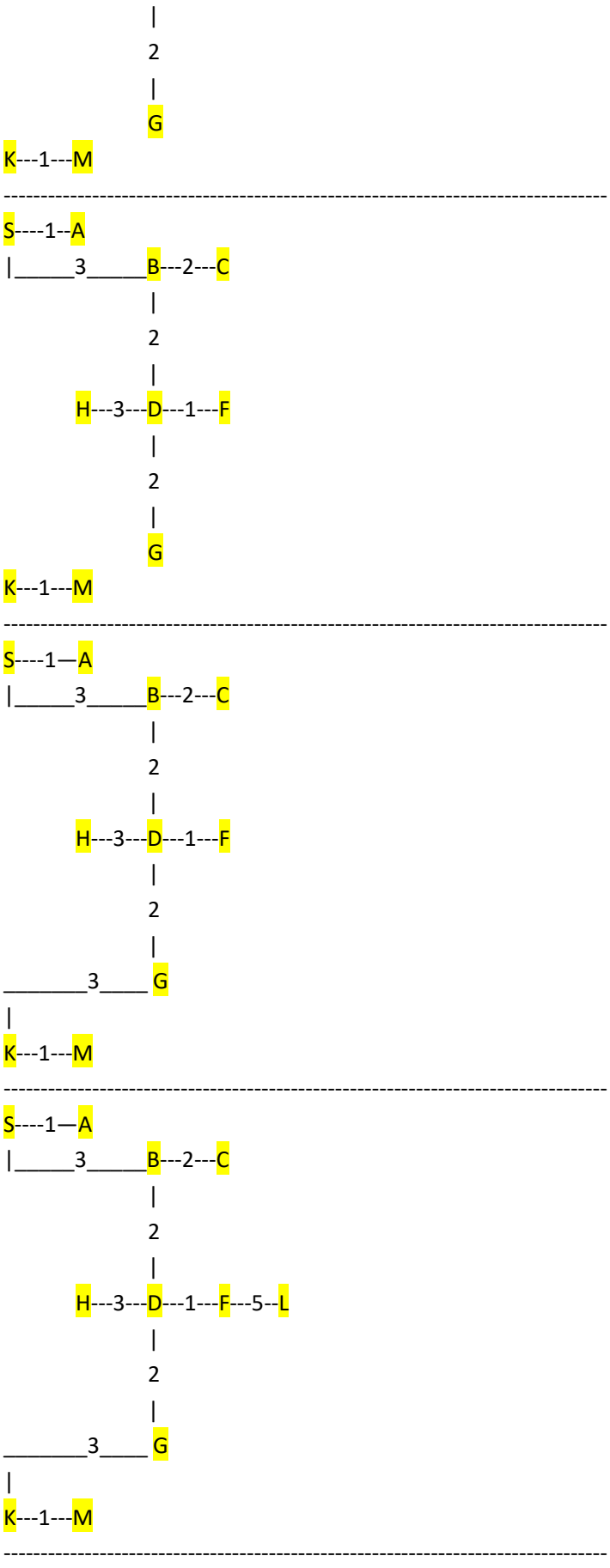
Kruskal's Minimum Spanning Tree algorithm;
There are 14 vertices and 13 edges(number of vertoices - 1)
After sorting:

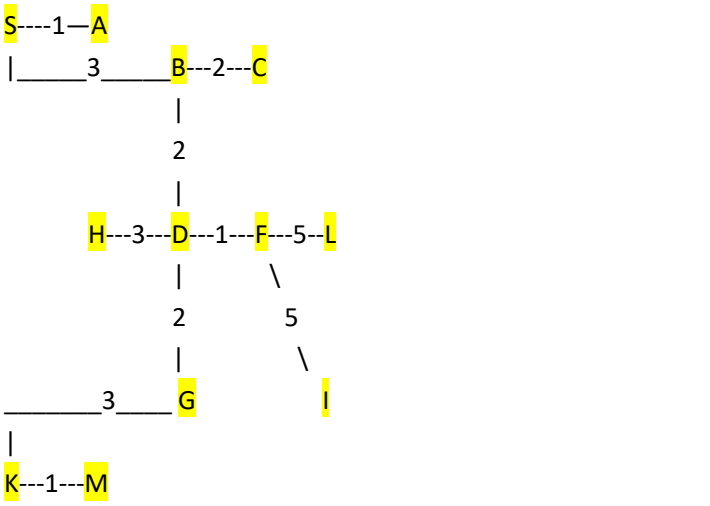
Weight	Src	Dest
1	S	A
1	D	F
1	K	M
2	B	C
2	B	D
2	D	G
3	S	B
3	D	H
3	G	K
5	F	L
5	F	I
5	G	J
8	K	E

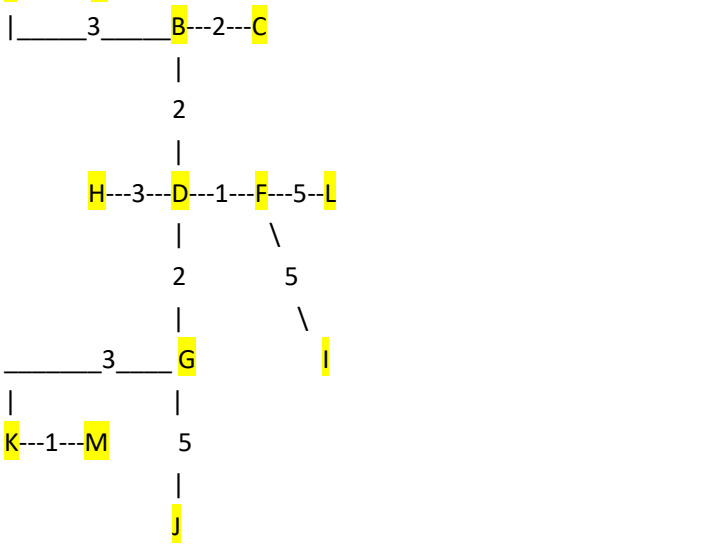
Now pick all edges one by one from sorted list of edges:

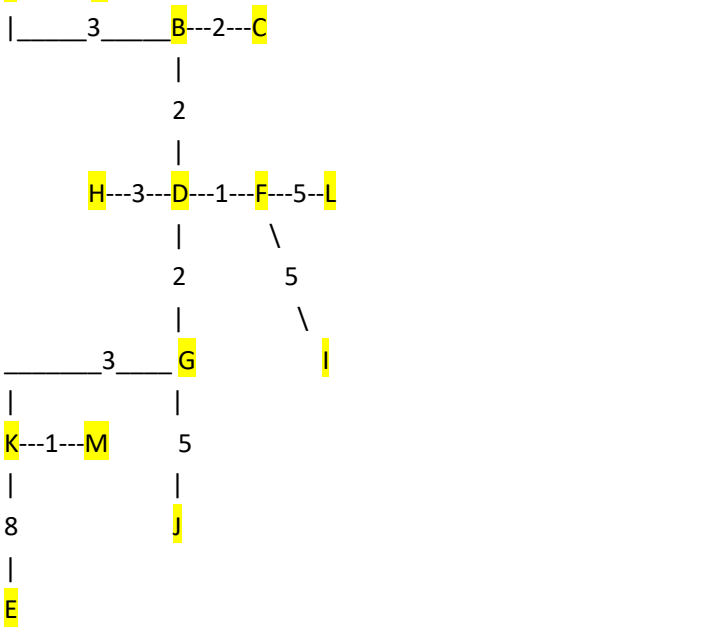
S---1---A


S---1---A
D--1----F
S---1---A
D--1----F
K---1---M
S----1--A
B---2----C
D---1---F
K---1---M
S----1--A
B---2----C
|
2
|
D---1---F
K---1---M
S----1--A
B---2---C
|
2
|
D---1---F
|
2
|
G
K---1---M
S----1--A
|_____3_____B---2---C
|
2
|
D---1---F


|
2
|
G
K---1---M
S----1--A
|_____3_____B---2---C
|
2
|
H---3---D---1---F
|
2
|
G
K---1---M
S----1—A
|_____3_____B---2---C
|
2
|
H---3---D---1---F
|
2
|
_____3____ G
|
K---1---M
S----1—A
|_____3_____B---2---C
|
2
|
H---3---D---1---F---5--L
|
2
|
_____3____ G
|
K---1---M


S----1—A
|_____3_____B---2---C
|
2
|
H---3---D---1---F---5--L
|
2
|
_____3____ G
|
K---1---M


S----1—A
|_____3_____B---2---C
|
2
|
H---3---D---1---F---5--L
|
2
|
_____3____ G
|
K---1---M
|
5
|
J


S----1—A
|_____3_____B---2---C
|
2
|
H---3---D---1---F---5--L
|
2
|
_____3____ G
|
K---1---M
|
5
|
J
|
8
|
E

So the shorstet path from S to E is 18

Comparing the performance of Prim's Minimum Spanning Tree algorithm and Kruskal's Minimum Spanning Tree algorithm in solving this question:
The time complexity of Prim's Minimum Spanning Tree algorithm is: O((v + E)logV)
The time complexity of Kruskal's Minimum Spanning Tree algorithm is: O(E * logV)
Thus, Kruskal's Minimum Spanning Tree algorithm is faster.