

# CSE221: Algorithms

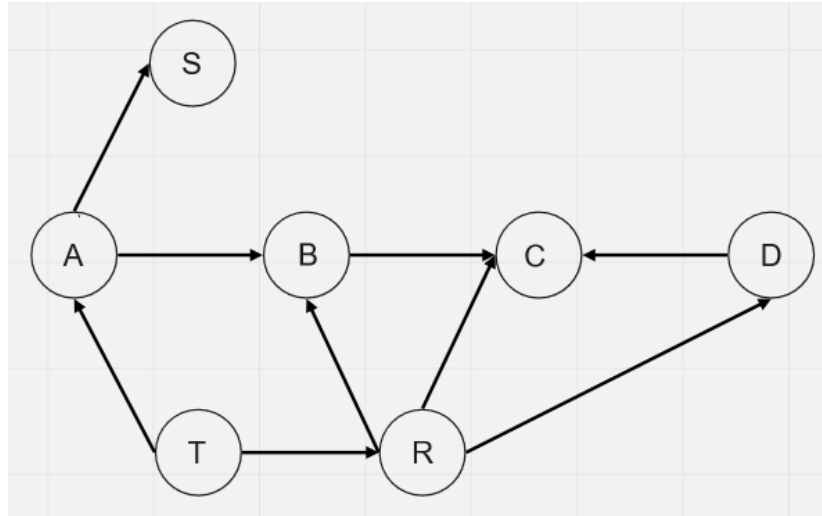
## Assignment 2

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Total marks:

1. For the graph given below perform the following tasks



- Perform a graph traversing strategy that is used to detect cycles in a graph. You can start traversing from vertex **A**.
- Perform topological sort on the given graph and display the order of the vertices.
- Find out all the strongly connected components of the given graph.

2. The table shows the distances, in units of 100 m, between seven houses, A to G.

	A	B	C	D	E	F	G
A	0	4	5	3	2	5	6
B	4	0	1	2	4	7	6
C	5	1	0	3	4	6	7
D	3	2	3	0	2	6	4
E	2	4	4	2	0	6	6

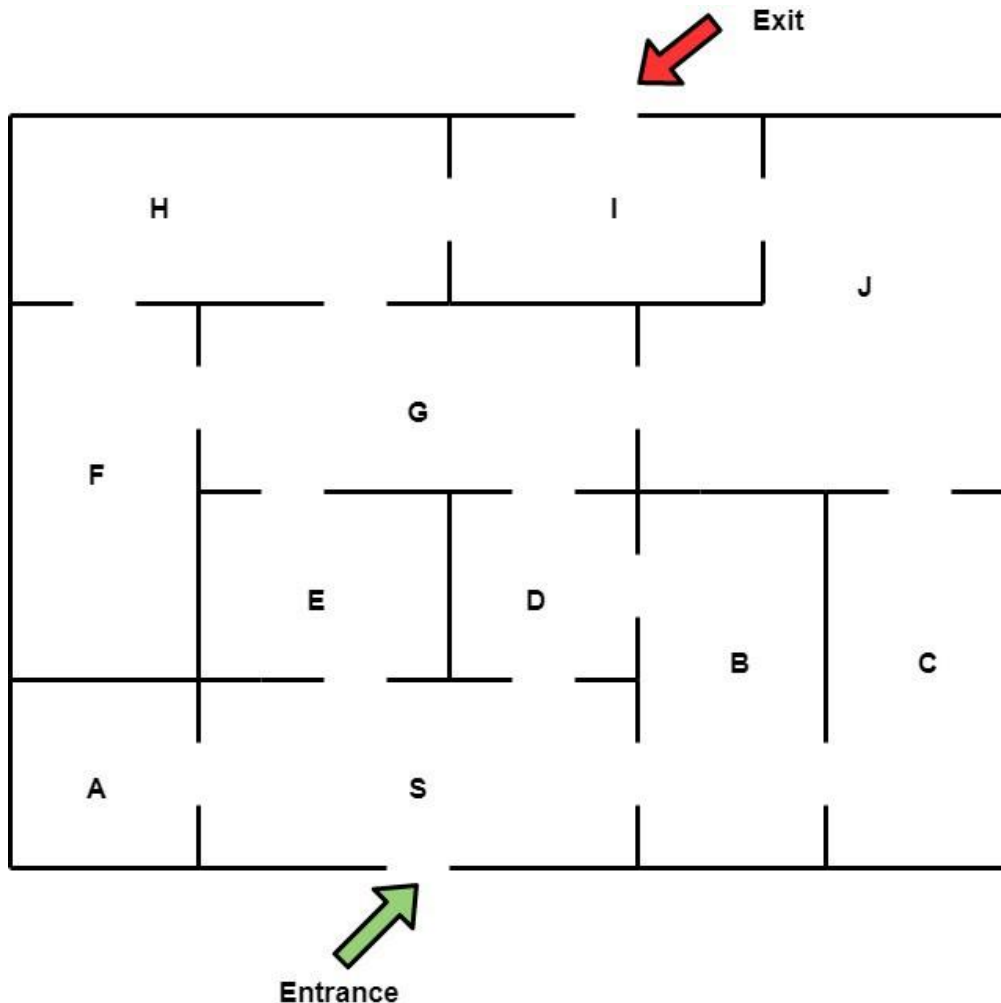
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<b>F</b>	5	7	6	6	6	0	10
<b>G</b>	6	6	7	4	6	10	0

Use Prim's algorithm on the table in the insert to find a minimum spanning tree. Start by crossing out row A. Show which entries in the table are chosen and indicate the order in which the rows are deleted. Draw your minimum spanning tree and state its total weight. [10]

3. For the maze shown below, use graph theory to determine whether it is possible to get out from the Entrance to the Exit. Walk through each doorway exactly once and exit the maze with the shortest path/ walking distance. Give justification to your answer why you chose this theory? Compare your answer with another theory/approach? [10]



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4. Finally, the mid-exam has ended for Spring2022. You and your BracU friends are planning on going to Cox's Bazar in your car.

A graph with  $N$  vertices representing  $N$  cities and  $M$  edges representing bidirectional roads between some pairs of cities. We can assume that you live in city 1 and Cox's Bazar in city  $N$ . Unfortunately, not everything is so good in life and examples are the speed limits. All of you decided to drive with permanent speed. Each of these  $M$  roads has a maximum permissible speed  $V$  that you can't exceed. However, as adventurous people, all of you wanted to drive the car as fast as possible.

Your task is to find the maximum speed you can reach to Cox's Bazar.

### Input Explanation:

On the first line of each test case there are two integers  $N$  and  $M$ . There are three integers on the next  $M$  lines,  $A$ ,  $B$ , and  $V$ , representing a bidirectional road between cities  $A$  and  $B$  with speed limit  $V$ .

Graph Input
4 5
1 2 80
3 1 20
2 3 60
4 3 300
2 4 90

### Task breakdown:

1. Find an appropriate algorithm for the given problem. [3]
2. Draw the graph. [2]
3. Find the maximum speed. (You need to show the necessary steps of the simulations) [5]