Graphs – 2

1. **Kruskal's Algorithm**

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Given an undirected, connected and weighted graph G(V, E) with V number of vertices (which are numbered from 0 to V-1) and E number of edges.

Find and print the Minimum Spanning Tree (MST) using Kruskal's algorithm.

**For printing MST follow the steps -**

1. In one line, print an edge which is part of MST in the format -

v1 v2 w

where, v1 and v2 are the vertices of the edge which is included in MST and whose weight is w. And v1 <= v2 i.e. print the smaller vertex first while printing an edge.

2. Print V-1 edges in above format in different lines.

**Note : Order of different edges doesn't matter.**

**Input Format :**

Line 1: Two Integers V and E (separated by space)

Next E lines : Three integers ei, ej and wi, denoting that there exists an edge between vertex ei and vertex ej with weight wi (separated by space)

**Output Format :**

MST

**Constraints :**

2 <= V, E <= 10^5

**Sample Input 1 :**

4 4

0 1 3

0 3 5

1 2 1

2 3 8

**Sample Output 1 :**

1 2 1

0 1 3

0 3 5

1. **Prim's Algorithm Problem**

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Given an undirected, connected and weighted graph G(V, E) with V number of vertices (which are numbered from 0 to V-1) and E number of edges.

Find and print the Minimum Spanning Tree (MST) using Prim's algorithm.

**For printing MST follow the steps -**

1. In one line, print an edge which is part of MST in the format -

v1 v2 w

where, v1 and v2 are the vertices of the edge which is included in MST and whose weight is w. And v1 <= v2 i.e. print the smaller vertex first while printing an edge.

2. Print V-1 edges in above format in different lines.

**Note : Order of different edges doesn't matter.**

**Input Format :**

Line 1: Two Integers V and E (separated by space)

Next E lines : Three integers ei, ej and wi, denoting that there exists an edge between vertex ei and vertex ej with weight wi (separated by space)

**Output Format :**

MST

**Constraints :**

2 <= V, E <= 10^5

**Sample Input 1 :**

4 4

0 1 3

0 3 5

1 2 1

2 3 8

**Sample Output 1 :**

0 1 3

1 2 1

0 3 5

1. **Dijkstra's Algorithm**

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Given an undirected, connected and weighted graph G(V, E) with V number of vertices (which are numbered from 0 to V-1) and E number of edges.

Find and print the shortest distance from the source vertex (i.e. Vertex 0) to all other vertices (including source vertex also) using Dijkstra's Algorithm.

Print the ith vertex number and the distance from source in one line separated by space. Print different vertices in different lines.

**Note : Order of vertices in output doesn't matter.**

**Input Format :**

Line 1: Two Integers V and E (separated by space)

Next E lines : Three integers ei, ej and wi, denoting that there exists an edge between vertex ei and vertex ej with weight wi (separated by space)

**Output Format :**

In different lines, ith vertex number and its distance from source (separated by space)

**Constraints :**

2 <= V, E <= 10^5

**Sample Input 1 :**

4 4

0 1 3

0 3 5

1 2 1

2 3 8

**Sample Output 1 :**

0 0

1 3

2 4

3 5