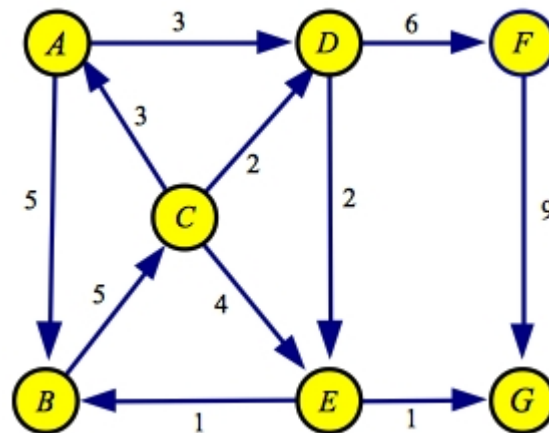
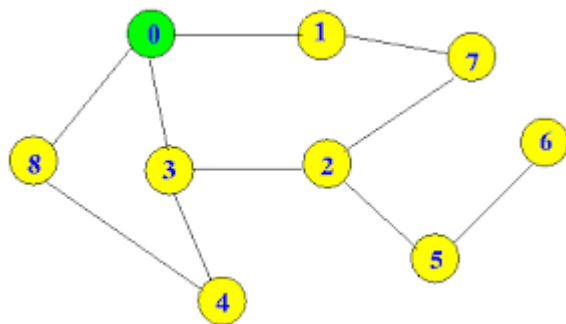


INTRODUCTION TO GRAPHS



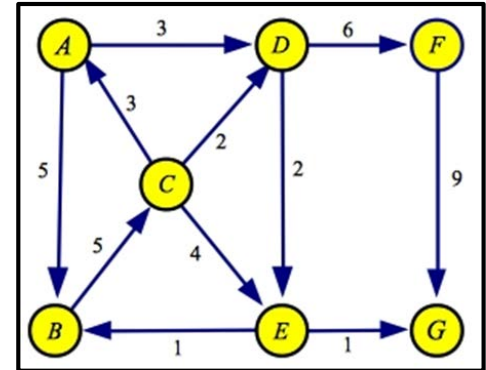
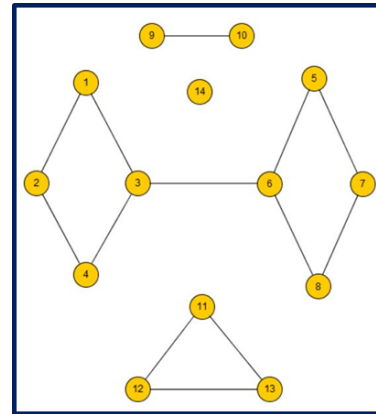
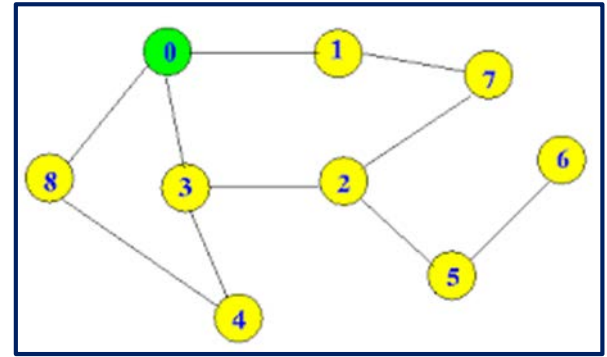
Aritra Hazra & Partha P Chakrabarti

Indian Institute of Technology Kharagpur

Graphs

A Graph $G = (V, E)$ consists of the following:

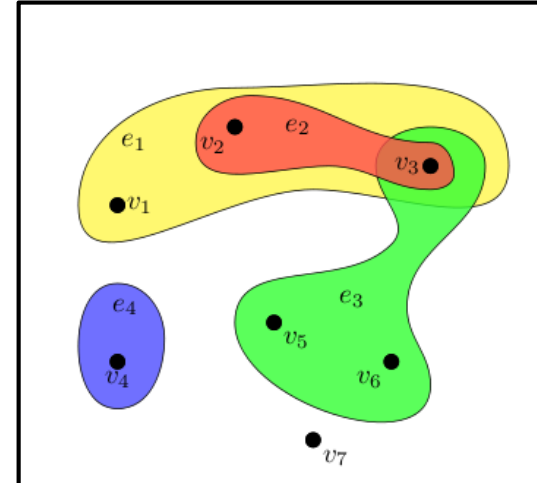
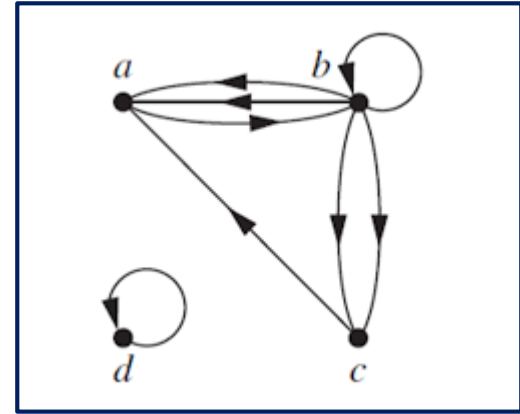
- A set of Vertices or Nodes V
 - Nodes may have one or more labels
- A set of Edges E where each edge connects vertices of V
 - An edge usually defines a connection or relationship between vertices or nodes
 - The edges can be undirected or directed
 - Each edge can have one or more labels
 - Usually there is at most one edge between vertices, there could be multiple edges between the same nodes.
 - Normally an edge connects two vertices, but in general we could have hyper-edges



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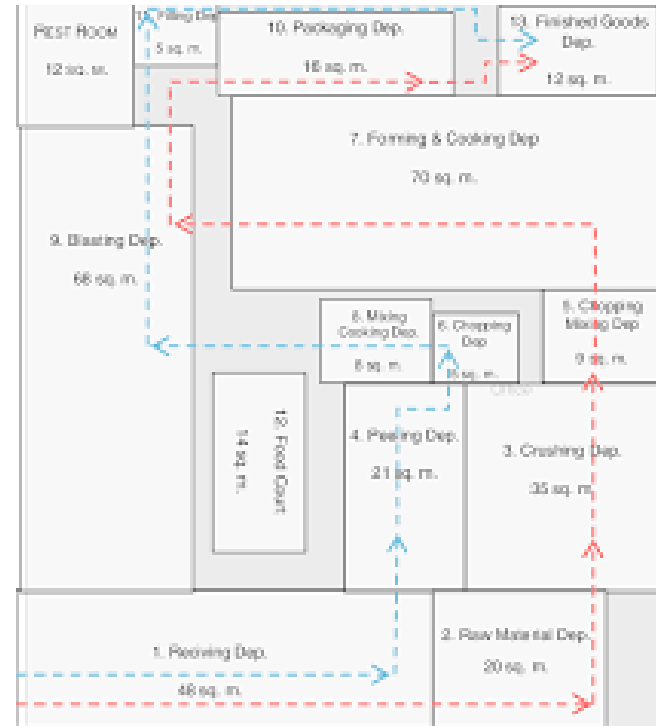
Some Applications of Graphs

- Maps, Routes
- Layouts
- Circuits and Networks
- Relationships
- Constraints
- Dependencies
- Flow Charts
- State Machines



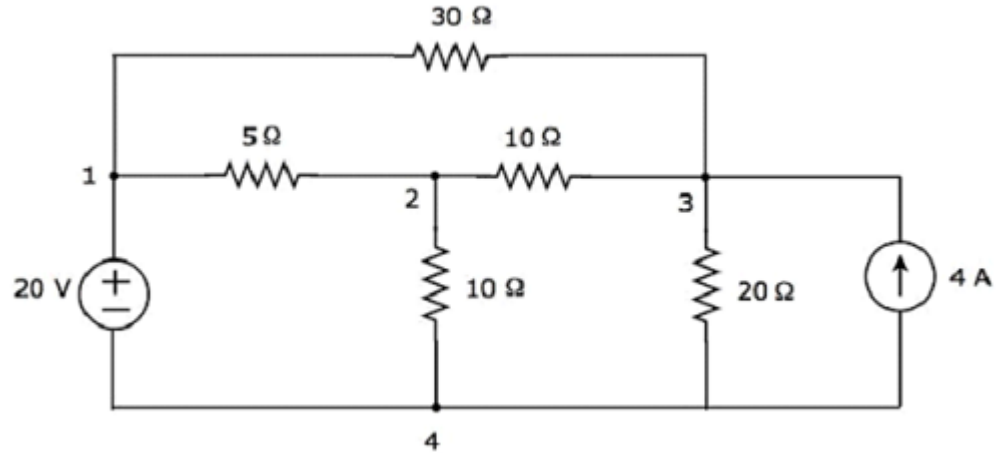
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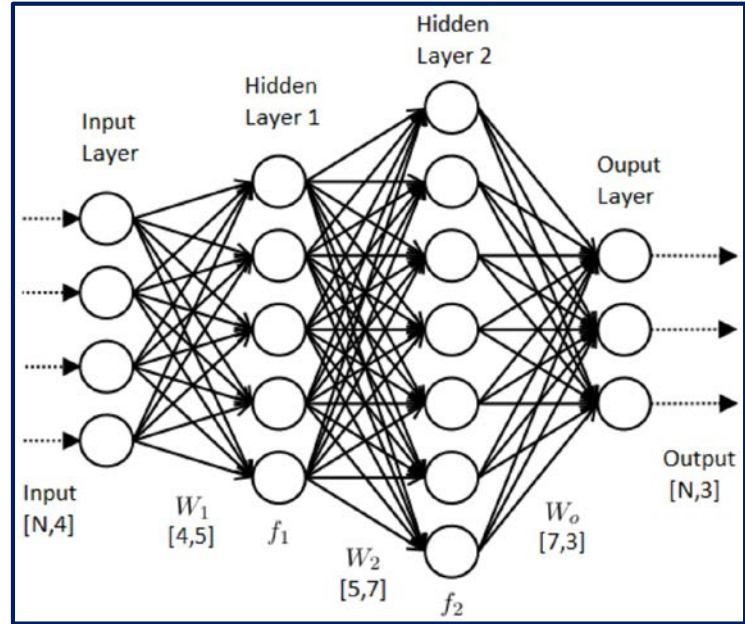
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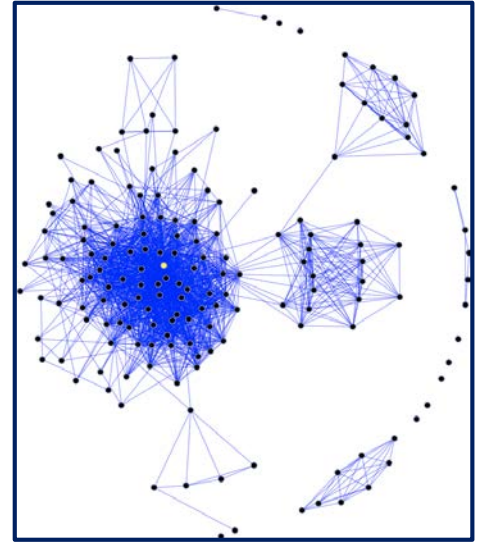
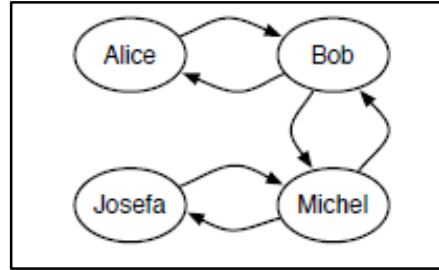
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1		2		3
	4		5	
6		7		
8				

Instructions

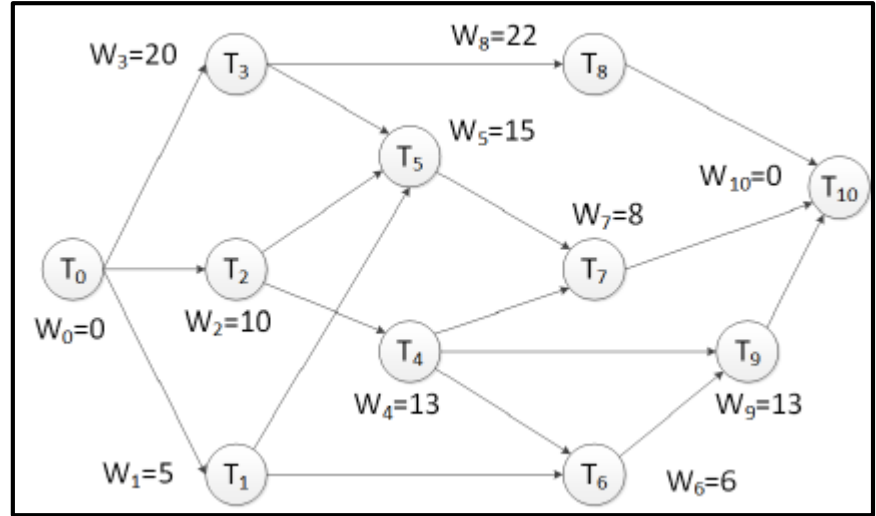
- fill in words from the list

List of Words

• Aft	• Laser
• Ale	• Lee
• Eel	• Line
• Hike	• Sails
• Hoses	• Sheet
• Keel	• Steer
• Knot	• Tie

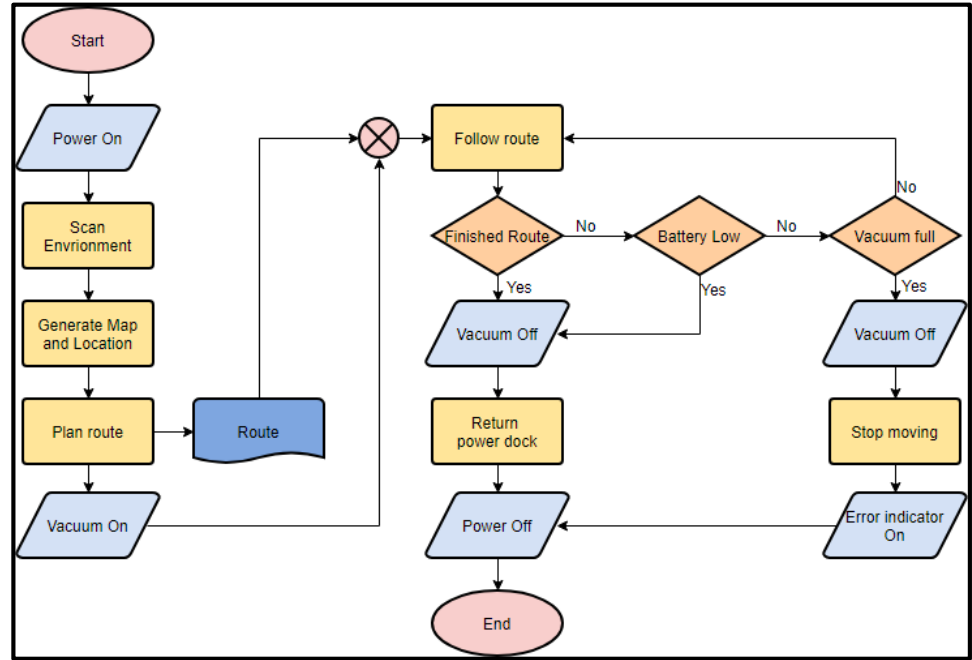
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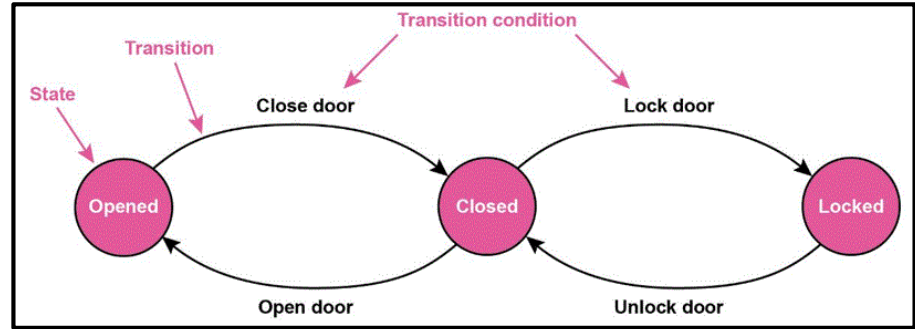
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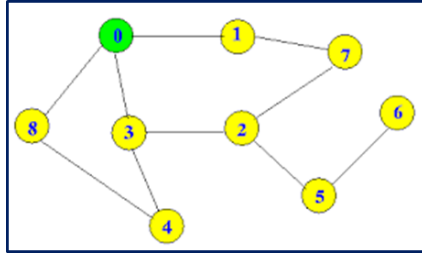
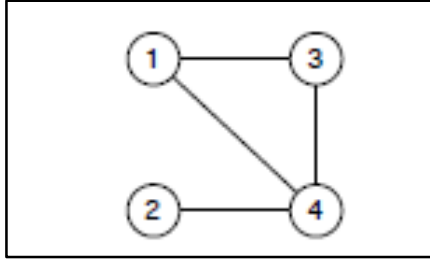


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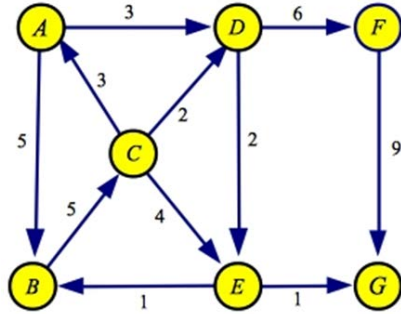
Graph Representation



Adjacency List

Adjacency Matrix

Graph Representation

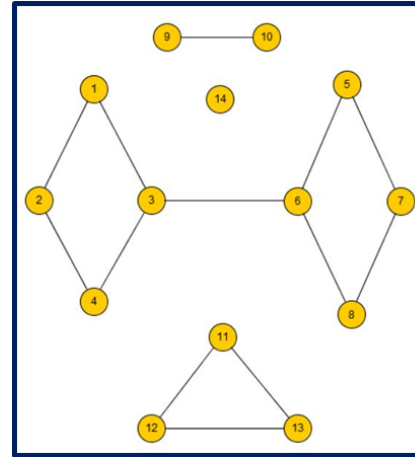


Adjacency Matrix

Adjacency List

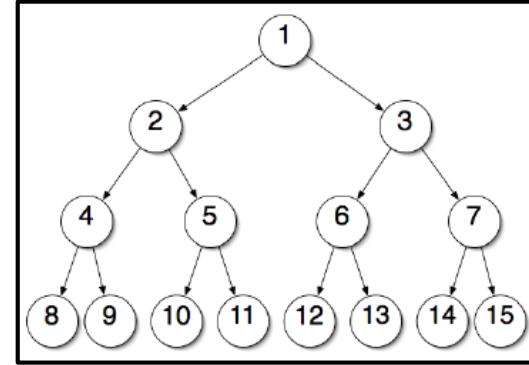
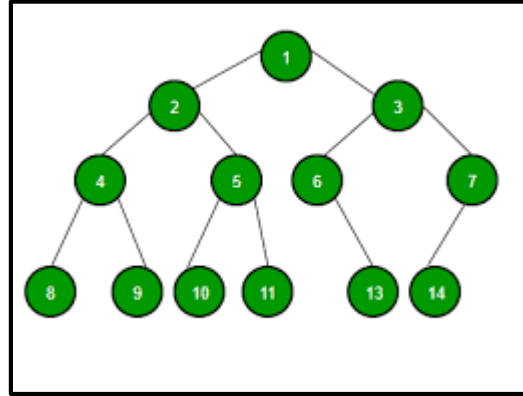
Some Algorithms on Graphs

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- Costs & Distances
- Spanning Trees
- Shortest Paths
- Flows



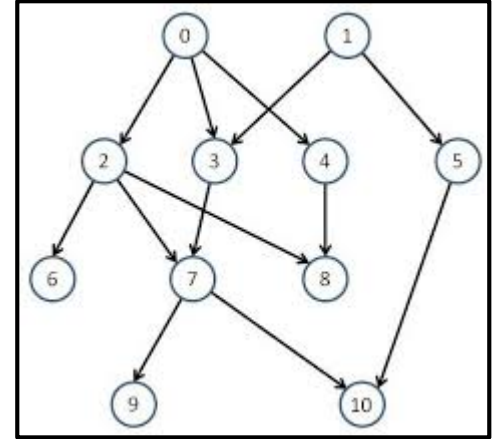
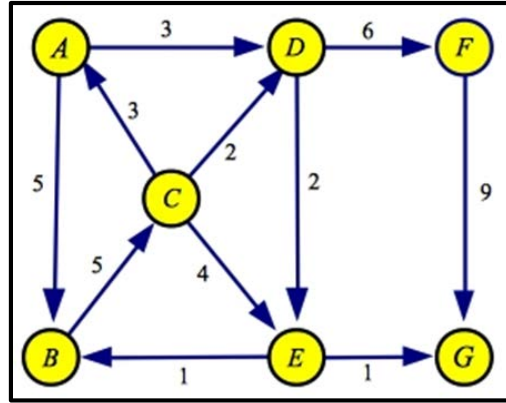
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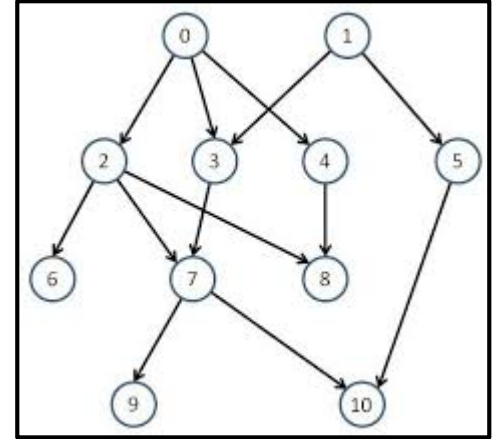
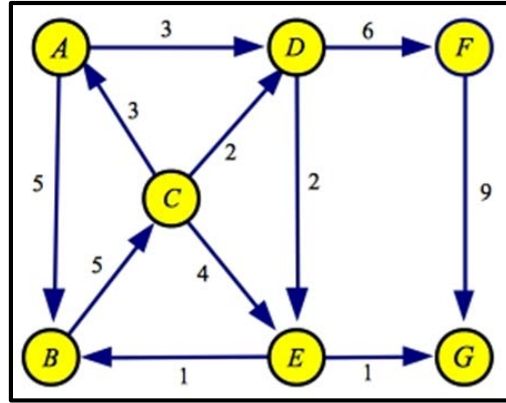
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Thank you