Data Structures & Algorithms

10: Graphs; Part-II

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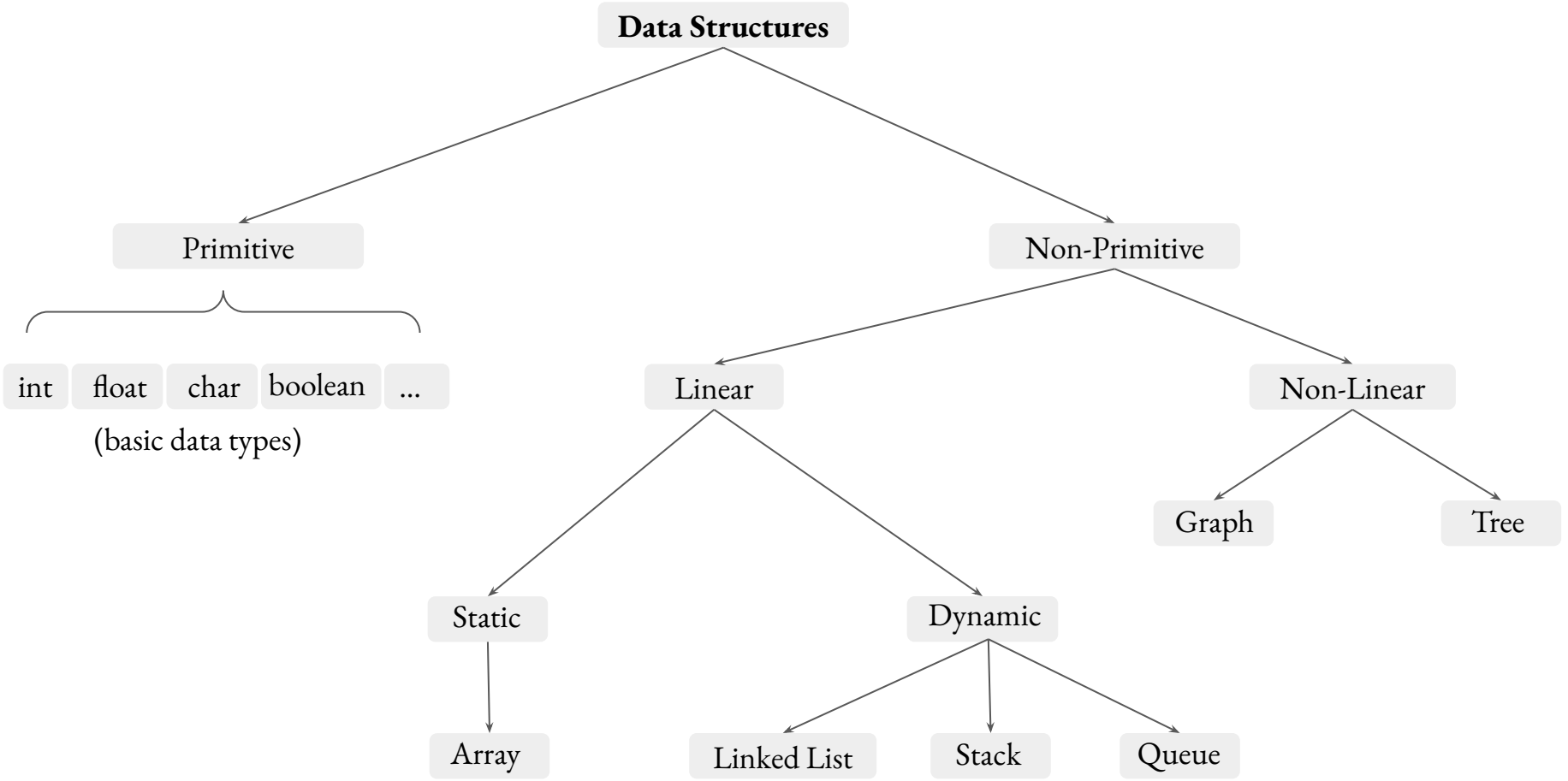
Update in the class test dates:

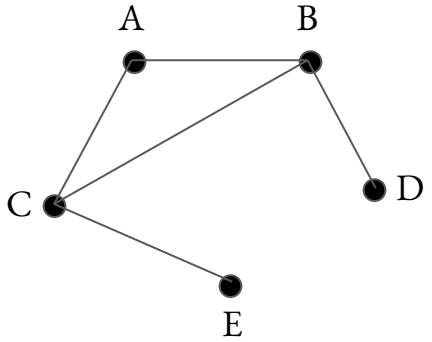
- CT-02 → 26-Apr-2024, Friday
- CT-03 → 17-May-2024, Friday
- CT-04 → 31-May-2024, Friday


Data Structures
Primitive
Non-Primitive
int
float
char
boolean
...
(basic data types)
Linear
Non-Linear
Graph
Tree
Static
Dynamic
Array
Linked List
Stack
Queue

Graphs

Connected Graph

A graph G is connected if there is a path between any two of its vertices.



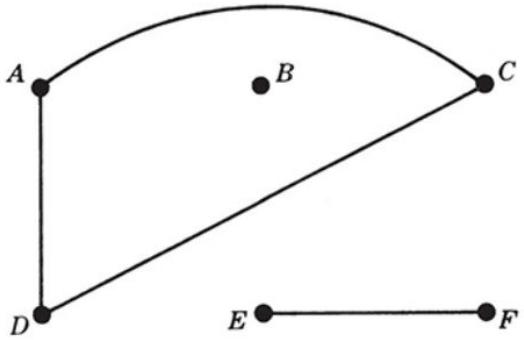
Diameter of Graph

The maximum distance between any two vertices in connected graph.
diam(G) = 3 in the example.

Connected Components

A subgraph where every vertex is reachable from every other vertex.

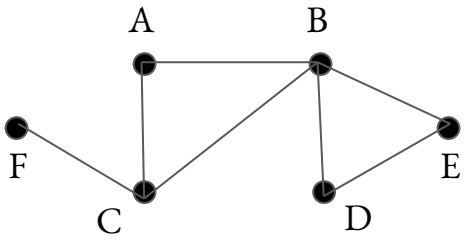
{A, D, C}, {E, F} and {B} are the connected components in the graph shown to right side.

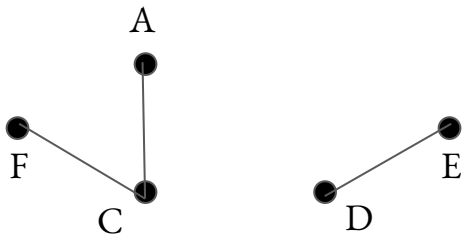


Note: An isolated vertex is considered a connected component.

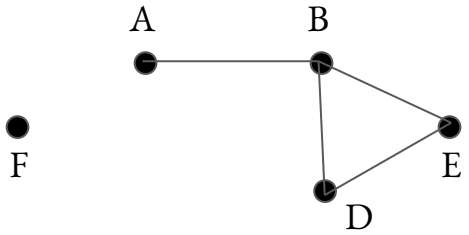
Cut Point / Vertex

A vertex **v** in **G** when removed, i.e., **G - v** will lead to more number of connected components.





G - B

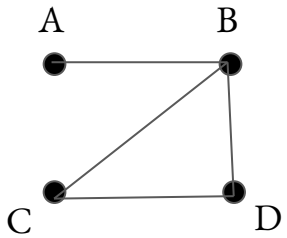


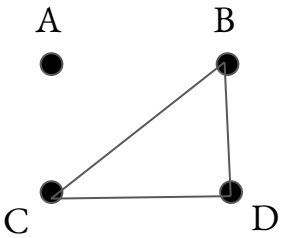
G - C

Both **B** and **C** are cut points of **G**

Bridge

An edge **e** in **G** when removed, i.e., **G - e** will lead to more number of connected components.





G - {A,B}

{A,B} is a bridge

Graphs

Directed Graphs

A directed graph **G** or digraph consists of two things:

(i) A set **V** whose elements are called vertices, nodes, or points.

(ii) A set **E** of ordered pairs **(u, v)** of vertices called **arcs** or **directed edges.**

Suppose **e** = **(u, v)** is a directed edge in a **digraph G**. Then the following terminology is used:

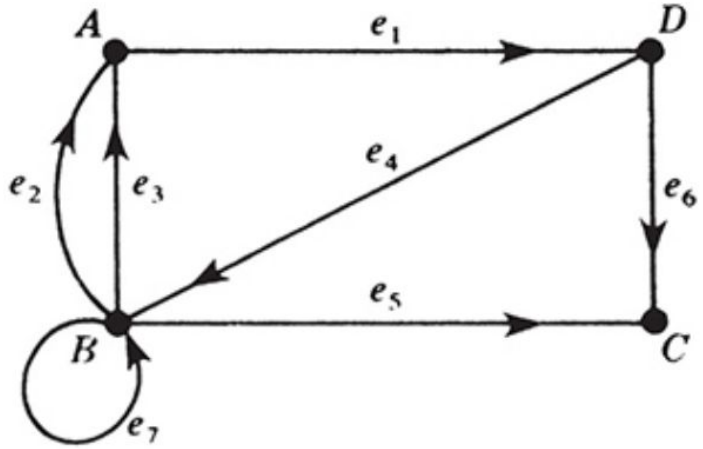
(i) **e** begins at **u** and ends at **v**.

(ii) **u** is the origin or initial point of **e**, and **v** is the destination or terminal point of **e**.

(iii) **v** is a successor of **u**.

(iv) **u** is adjacent to **v**, and **v** is adjacent from **u**.

Graphs



G(V, E) is a directed graph:

V(G) = {A, B, C, D}

E(G) = $\{e_1, e_2, \ldots, e_7\}$

= {(A, D), (B, A), (B, A), (D, B), (B, C), (D, C), (B, B)}