Date 09/07/2025

Assignment 12

R-6.1

A simple undirected graph with

12 vertices

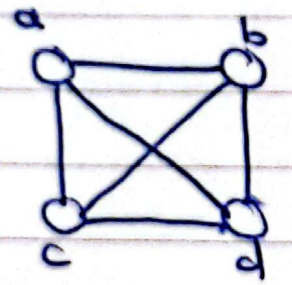
18 edges

3 connected components

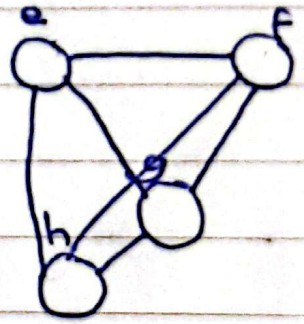
number of vertices each component

$12/3 = 4$

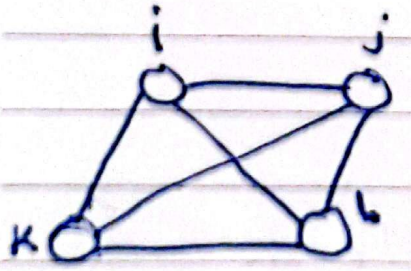
component 1



component 2



component 3



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it is impossible for G to have 3 connected components and 66 edge's because the maximum number of edges in any simple graph with 12 vertices is 66 which only happens when the graph is fully connected ie has only 1 connected component.

Splitting the graph into 3 components means fewer possible edges overall.

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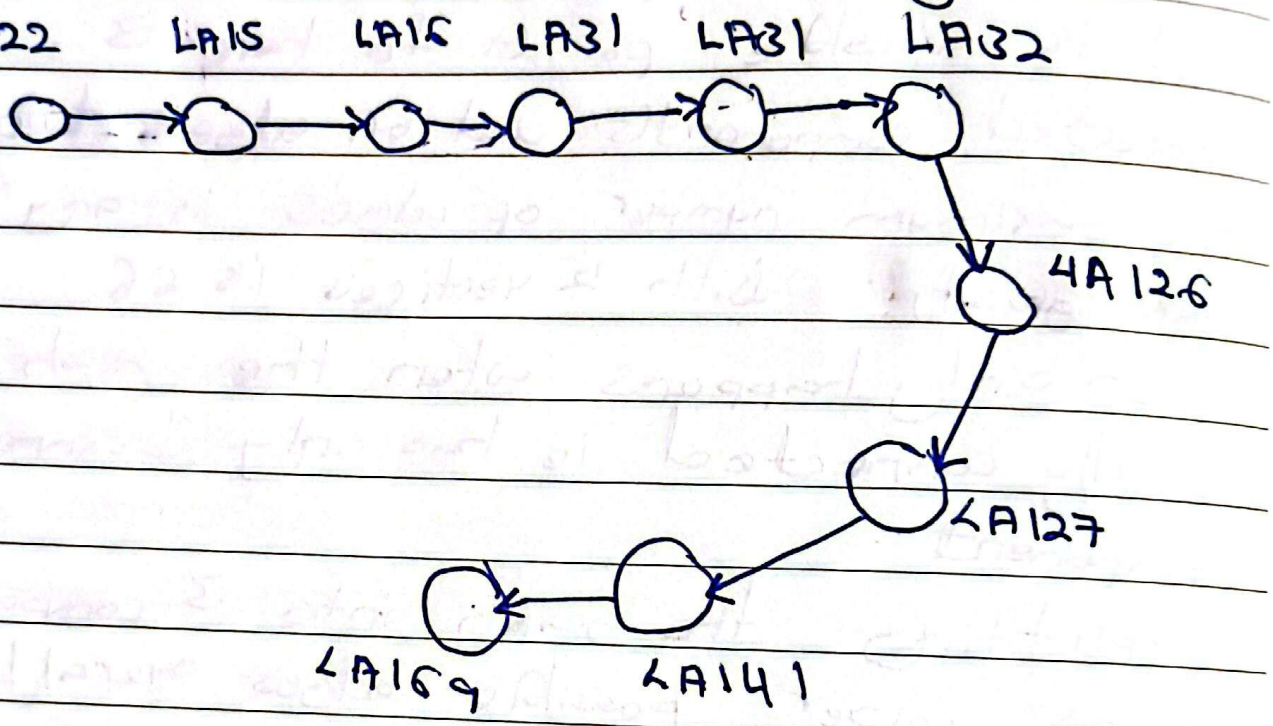
R-6.4 Topological Sorting.



Connected and complete graph.

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R-6.7

a) Use An Adjacency List
- A matrix would require 10,000 x 10,000 = 100M entries.
- But there are only 20,000 edges (sparse)
- Adjacency list only stores existing edges. saving space.

b) use Adjacency Matrix because
- With 20 million edges, the graph is very dense.
- A matrix (100 million entries) is efficient here.
- Lists become large and costly to traverse.
- Matrix allow constant-time access and is fine space-wise when graph is dense.

c) use Adjacent matrix
- Matrix allows O(1) time for areAdjacent(u, v)
- List would require O(k) time (where k is number of neighbours of u)