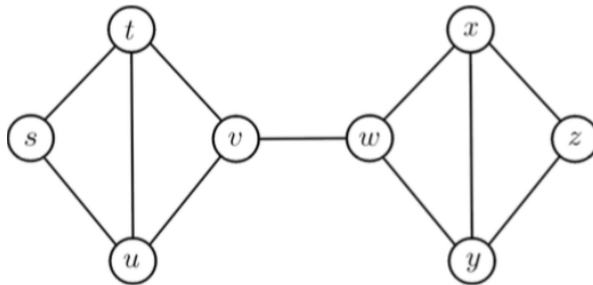# Discrete Mathematics
Practice Class 1
6-02-2024

Problem 1. Consider the following graph:

(i) Represent this graph using mathematical notation.

(ii) Indicate whether the following statements are true or false:
- The graph is directed.
- The graph is undirected.
- The graph is mixed.
- Vertices v and w are adjacent.
- t and u are not adjacent.

(iii) Fill in the blanks:
- That graph has_____ vertices.
- It has _____arcs and _____edges.
- Vertex v is adjacent with vertices_____.
- Vertex w is adjacent with vertices_____.

(iv) Create that graph in Magrada in the text mode and save it with the name graph1.
(v) Add an edge incident with the vertices t and x.
(vi) Add a loop in the vertex z.
(vii)Delete vertices v and w.
(viii) Save the graph with the name graph2. Draw this graph:

(ix) Fill in the blanks:
- graph2 is a graph _____(directed, undirected or mixed).
- The mathematical notation is_____
_____.
- This graph is_____(simple or multigraph) because_____
_____
_____.

Problem 2. Consider the undirected graph G=(V,E).

  V = {1,2,3,4},

  E = {{1,1}, {1,2}, {2,1}, {3,3}, {3,4}, {2,4}}.

(i) Draw this graph:

(ii) Create this graph in Magrada, in the graphic mode.

(iii) Fill in the blank
  • This graph is not simple because_____
  _____.

(iv) Delete, in the graphic mode, the loops of the graph.

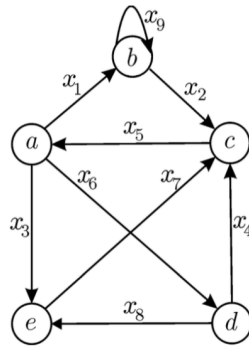(v) Draw the resulting graph:

(vi) Fill in the blank
  • This graph is_____(simple or multigraph) because_____
  _____.

(vii) On the last graph, delete, in the graphic mode, the vertex 1 and edges incident with the
  vertices 3 and 4. Draw the resulting graph.

(viii) Fill in the blank
  • This graph is_____(simple or multigraph) because_____
  _____.

Problem 3. Consider the directed graph G:

Answer the following questions. Justify your answers.
(i)   What arcs are incident with the vertex c? For these arcs indicate the origin and the terminus.

(ii) Is graph G complete?

(iii) Consider the subgraph obtained deleting the loop. Is this subgraph bipartite?

(iv) Compute the indegree and the outdegree for every vertex in graph G.

(v) Compute $\Gamma(v)$ and $\Gamma^{-1}(v)$ for every vertex v in G.

(vi) Analyze if there exists a relationship between $\Gamma(v)$ and $d_{out}(v)$. This relationship can be generalized for an arbitrary graph?

(vii) Analyze if there exists a relationship between $\Gamma^{-1}(v)$ and $d_{in}(v)$. This relationship can be generalized for an arbitrary graph?

Problem 4. Consider a graph with 7 edges and 6 vertices. This graph has 5 vertices with degree 2. Compute the degree of the last vertex.