Djilali Bounaâma University, Khemis Miliana
Faculty of Matter Sciences and Computer Science
Computer Science Department

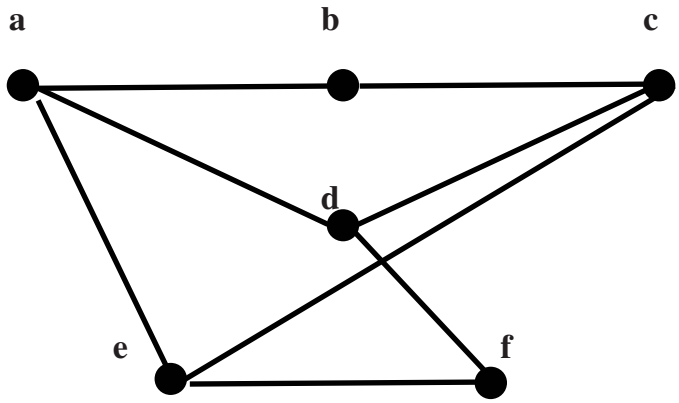
2nd Year Computer Science

Module: Graph Theory

Tutorial Session (4)

Exercise 1:

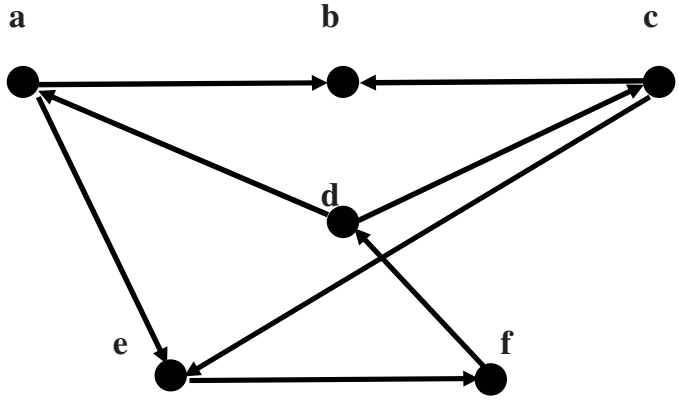
Let **G** the following multigraph:



1. Is the graph **G**:
   a) Simple b) Regular c) Symmetric d) Antisymmetric e) Complete f) Clique g) Bipartite h) Complete bipartite i) Connected j) Planar?
2. Determine:
   a) Subgraph of **G** generated by **{a, d, c, e}.**
   b) Partial graph of **G** generated by **{ {a, b}, {c,d} , {d,f} }**.
   c) Partial subgraph of **G**.
   d) Complement graph of **G** (if it exists).
   e) Dual graph (if it exists).
   f) Stable set of **G**.

Exercise 2:

Let **G** the following graph:



1. Determine:
   - **a)** The order and the size of the graph **G**.
   - **b)** Determine the multiplicity of the graph **G**.
   - **c)** The outer demi-degree, inner demi-degree and the total degree for each vertex of the graph **G**.
   - **d)** $\Gamma_G^+(\mathbf{d})$ the set of successors of vertex **d** , $\Gamma_G^-(\mathbf{d})$ the set of predecessors of vertex **d** and $\Gamma_G(\mathbf{d})$ the set of neighbors of vertex **d**.
   - **e)** $\mathbf{m}_G^+(\mathbf{a},\mathbf{b})$ the multiplicity of $(\mathbf{a},\mathbf{b})$.
   - **f)** $\omega_G(\{\mathbf{a},\mathbf{d},\mathbf{c}\})$ the set of arcs incident to the set **{a,d,c}**.
   - **g)** A path between vertices **f** and **e**. Is it a simple path? Is it an elementary path?
   - **h)** A circuit.
   - **i)** A cocycle.
2. Represent the graph using : a) vertex-vertex incidence matrix b) Vertex-arc incidence matrix.
3. Give the condensed forms of the vertex-vertex incidence matrix.
4. Is **G** a simply connected graph? b) Is it a strongly connected graph?