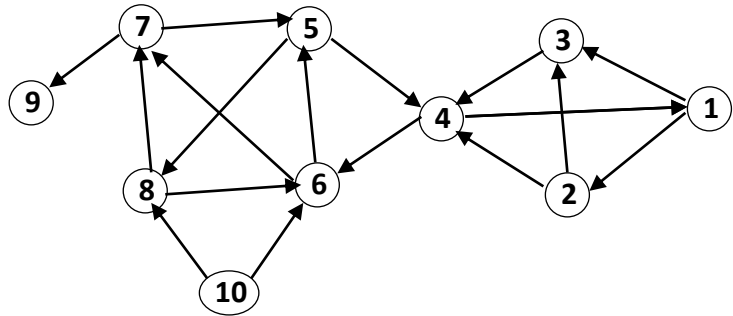


TUTORIALS - SERIES NO. 01

Exercise 01

Let the following graph $G(X, U)$:



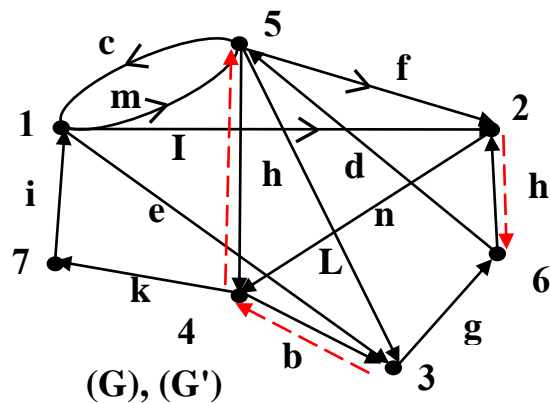
1. Give the order and size of the graph G .
2. Represent the graph using:
 - a) An adjacency matrix
 - b) An incidence matrix
3. Find: $\Gamma^+(6), \Gamma^-(4), \Gamma(5)$.
4. Find: $d^+(8), d^-(2), d(6)$.
5. Find: $I^+(4), I^-(6), I(8)$.
6. Find a path between vertices 4 and 6? Is it simple? Is it elementary?
7. Give a simply connected component
8. Give a strongly connected component

Exercise 02

Let $G(X, U)$ be the following graph:

With: $X = \{1, 2, 3, 4, 5, 6, 7\}$

$U = \{a, b, c, d, e, f, g, h, i, j, k, l, m, n\}$



- 1 - Among the n-uples below specify: paths, simple paths, elementary paths :
 $(g, d, f, i), (h, b, e, j), (b, g, d, c, e, g, a), (i, e, g, d, c, j), (k, i, e, g, d)$.
- 2 - Are the two paths $(5, 1, 3, 6, 5, 2)$ and (c, e, g, d, f) identical?
- 3 - Is the path $(4, 7, 1, 3, 6, 5, 4, 3, 6, 5, 4)$ a circuit? Is it simple? Is it elementary?
- 4 - The same previous question for the paths : $(3, 6, 2, 4, 7, 1, 5, 4, 3), (5, 4, 7, 1, 3, 6, 5)$

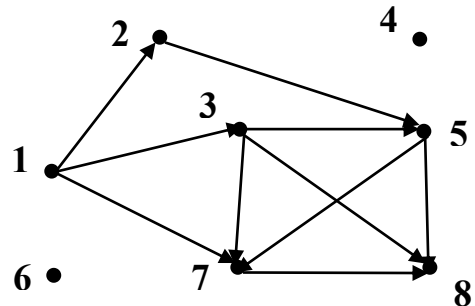
Reverse the arcs: a, b, h, d , then answer the questions below:

- 5 - Among the following n-uples: $(b, k, i, m, f, a), (j, n, h, c, m, l, b, k, i, e, g, d, f, a)$ which is Hamiltonian? Which one is Eulerian?

- 6 - Can we express them by the sequences of vertices (3, 4, 7, 1, 5, 2, 6), (1,2,4, 5, 1, 5, 3, 4, 7, 1, 3, 6, 5, 2, 6) ?
- 7 - Is the circuit (k, i, j, a, d, l, b) a Hamiltonian circuit? Give its equivalent in sequence of vertices?

Exercise 03

Let $G(X,U)$ be a directed graph



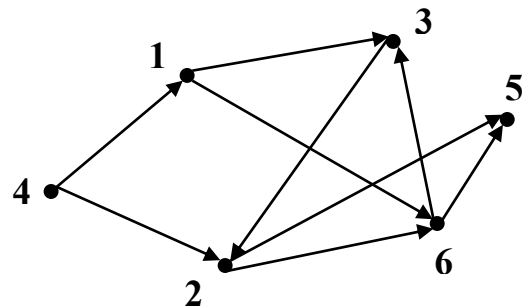
- 1 - Determine a source vertex, a sink vertex, isolated vertices
- 2 - Calculate $d^+(4), \Gamma(4), d(1), \Gamma(1), d^-(6), \Gamma^+(1), \Gamma^-(7), d(3)$
- 3 - Give the order and size of the graph G .
- 4 - Give a simple path between 1 and 8
- 5 - Give a chain between 2 and 7.

Exercise 04

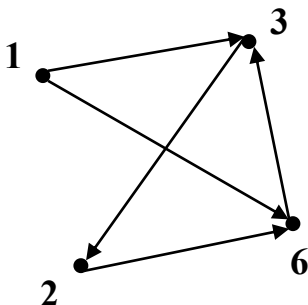
Let the following graph $G(X, U)$:

With: $X = \{1, 2, 3, 4, 5, 6\}$

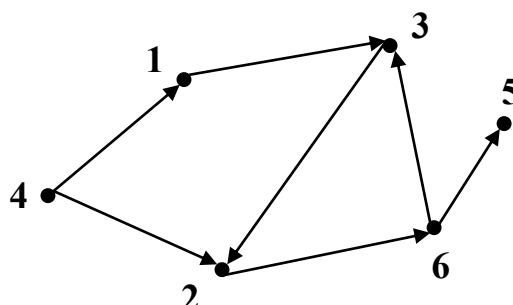
$U = \{(4,2), (2, 6), (1,3), (6,5), (1,6), (6,3), (2,5), (3,2), (4,1)\}$



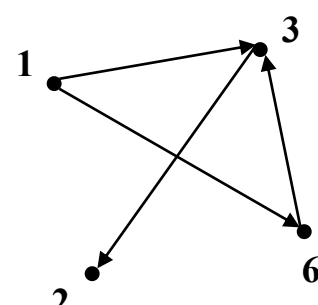
Specify which of the following graphs is a: subgraph, a partial graph, a partial subgraph?



(G1)



(G2)



(G3)

Good luck