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Module:Graph Theory/DCSO
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TUTORIALS - SERIES NO. 02 CORRECTION

EXERCISE N° 01

Study of connectivity in the following graphs:

(a) A connected graph
(b) An unconnected graph (contains 02 blocks)
(c) A connected component, the entire graph is not connected (composed of 2 blocks)
(d) A connected component, the graph is not connected (for the same reason)
(e) The two components delimited by the dotted lines are connected, the entire graph is also connected.

EXERCISE N° 02

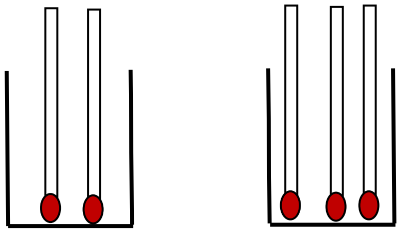
Study of the strong connectivity in the following graphs:

(a) A strongly connected graph
(b) Is not strongly connected (contains a source vertex and a sink vertex)
(c) Is not a StrCC (left), A StrCC (right), the graph is not strongly connected (there is a source vertex)
(d) Is not a strongly connected StrCC component (there is a well), the graph is not strongly connected (for the same reason)
(e) Not a StrCC, the graph is not strongly connected.

EXERCISE N° 03

Description of the match game:

- An urn U1 of N matches and another U2 of (N+1) matches
- Two players Mourad and Nassim (J1, J2)
- Each of the two players draws in turn, either a match from U1 or a match from U2, or a match from each urn.
- It's Mourad who starts playing.
- The player who picks up the last match wins.

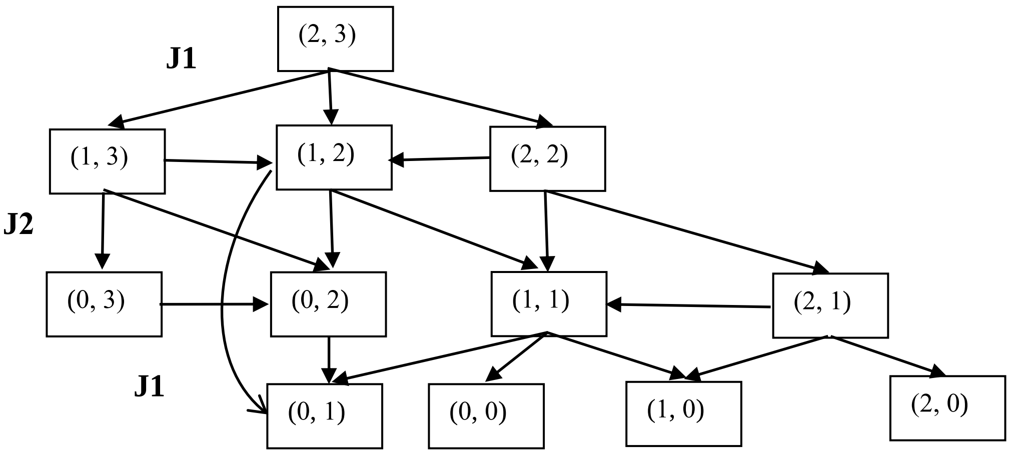


Urne U1
(N = 2 allumettes)

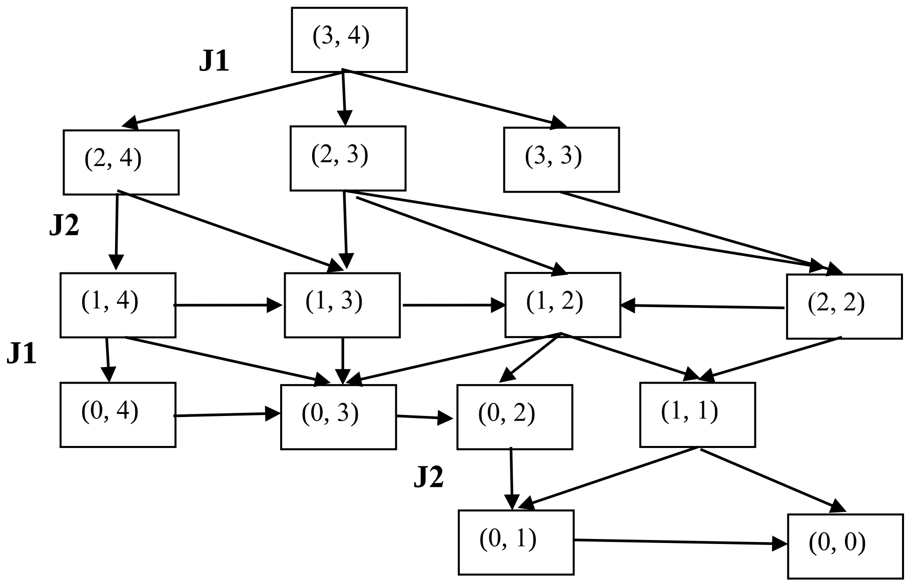
Urne U2
(N +1 = 03 allumettes)

Construction of a graph representing all possible moves in the game.

For N = 2

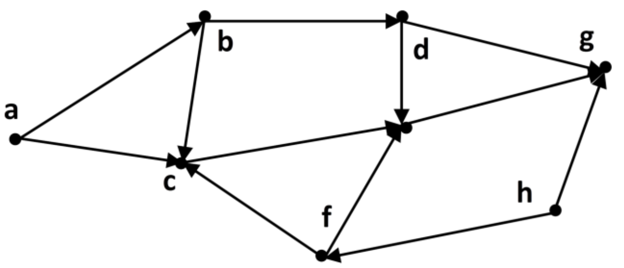


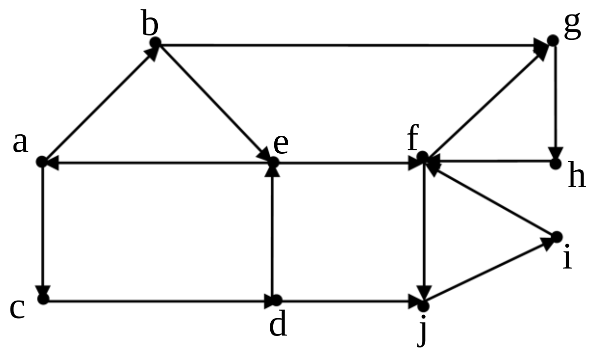
For N=3



EXERCISE N° 04

G1(X1,U1), G1(X2,U2) two directed graphs

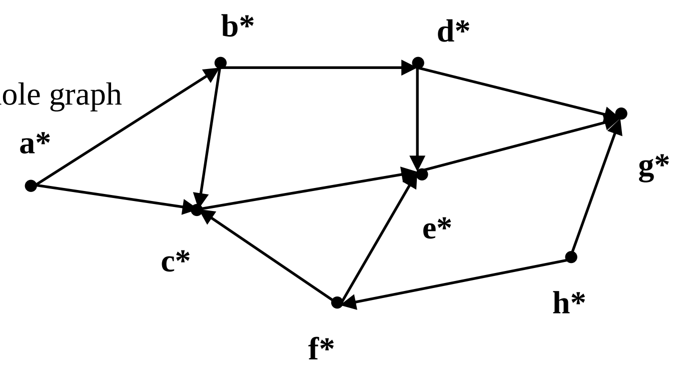




a) Application of the CSC search algorithm to find: SCC(a), SCC(d), SCC(g)

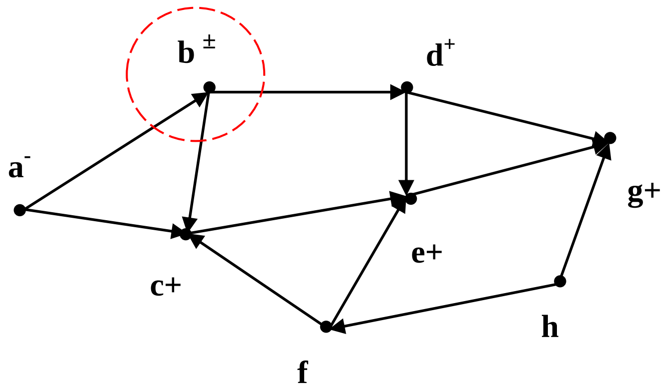
SCC(a) = {a, b, c, d, e, f, g}==> i.e. the whole graph
==> the graph G1 is simply connected,

from which it itself forms a single SCC
which contains all the vertices
==> SCC(c) = SCC(a) = the graph G1



b) – Application of the strongly connected component search algorithm to find:

StrCC(b), StrCC(f)

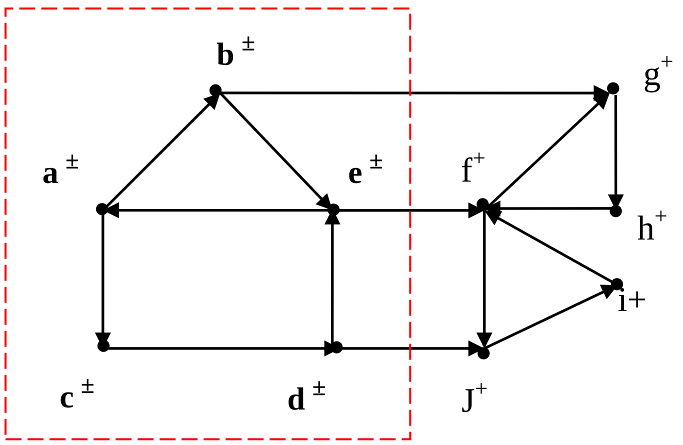


StrCC(b) = {b}

Similarly, we find that:

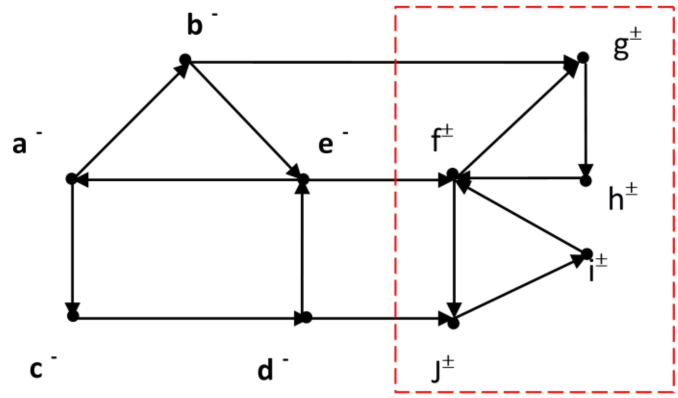
StrCC(f) = {f}

c) Let's apply the algorithm on G2 to find:
StrCC(e), StrCC(g), StrCC(i)



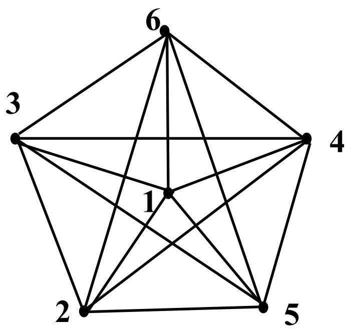
StrCC(e) = {a, b, c, d}

StrCC(g) = {g, f, h, i, j} = StrCC(i)

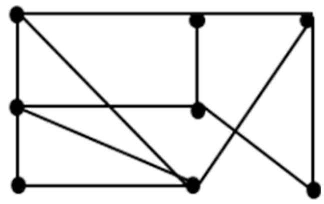


Exercise 05

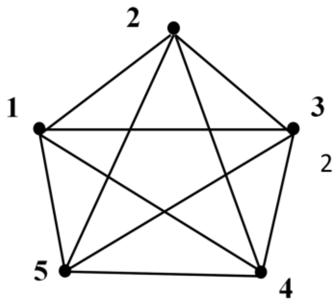
Among the figures below, give the one which represents a Hamiltonian graph? Eulerian?



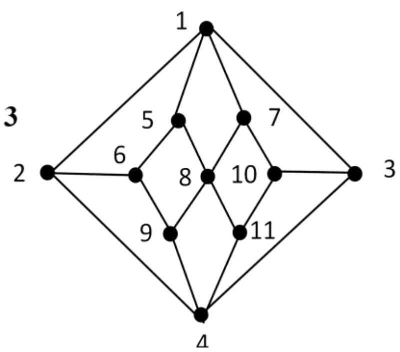
G1



G2



G3



G4

G1 is a Hamiltonian graph, because there exists a Hamiltonian path in the graph, is not Eulerian

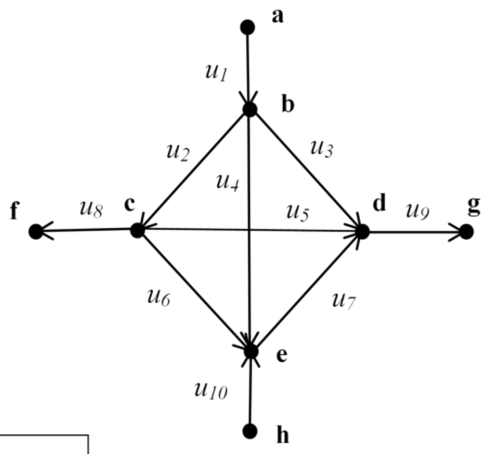
G2 is a Hamiltonian graph, but is not Heulerian

G3 is a Hamiltonian and Eulerian graph

G4 is a Hamiltonian graph, but is not Eulerian

EXERCISE N° 06

Representation og the graph G using:



1. A sorted list of arcs (by initial endpoint)

U1	U2	U3	U4	U5	U6	U8	U9	U7	U10
has	b	b	b	c	c	c	d	e	h
b	c	d	e	d	e	f	g	d	e

2. A linear list of successors with EOL

1. Une liste linéaire des successeurs avec EOL

1	2	3	4	5	6	7	8	9	10	11	12	13	14	13	14
b	$	c	d	e	$	d	e	f	$	g	$	d	$	e	$

Ptr Adr.1^er^Suc

1	3	7	11	13	nul	nul	13
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**

3. A list of predecessors

ha	b		
b	c	d	e
c	d	e	f
d	g		
e	d		
f			
g			
h	e		