Last name	
First name	
Group	

Grade	

Algorithmics
Undergraduate 2^{nd} year (s3)
Final Exam #3 (P3)
22 Dec. 2015 - 9:30
(D.S.308973.68 BW)
Answer Sheets

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Answers 1 **(Miscillaneous questions... –** ***3 points*****)**

1. (a) Circle the correct answer: YES – NO

   (b) Graphic justification...

2. (a) Circle the correct answer: YES – NO

   (b) Graphic justification...

3. Show that there can not also be a path $y' \rightsquigarrow y$ in G.

Answers 2 **(Directed acyclic graph... –** ***2,5 points*****)**

1. Concerning the classification of arcs, what is the particularity of a directed acyclic graph?

2. Show that for any pair of distinct vertices $x, y \in S$, if there exist an arc from x to y in G, then $os[y] < os[x]$.

Answers 3 **(Red-black Trees –** ***4 points*****)**

1. Red-black tree? YES – NO

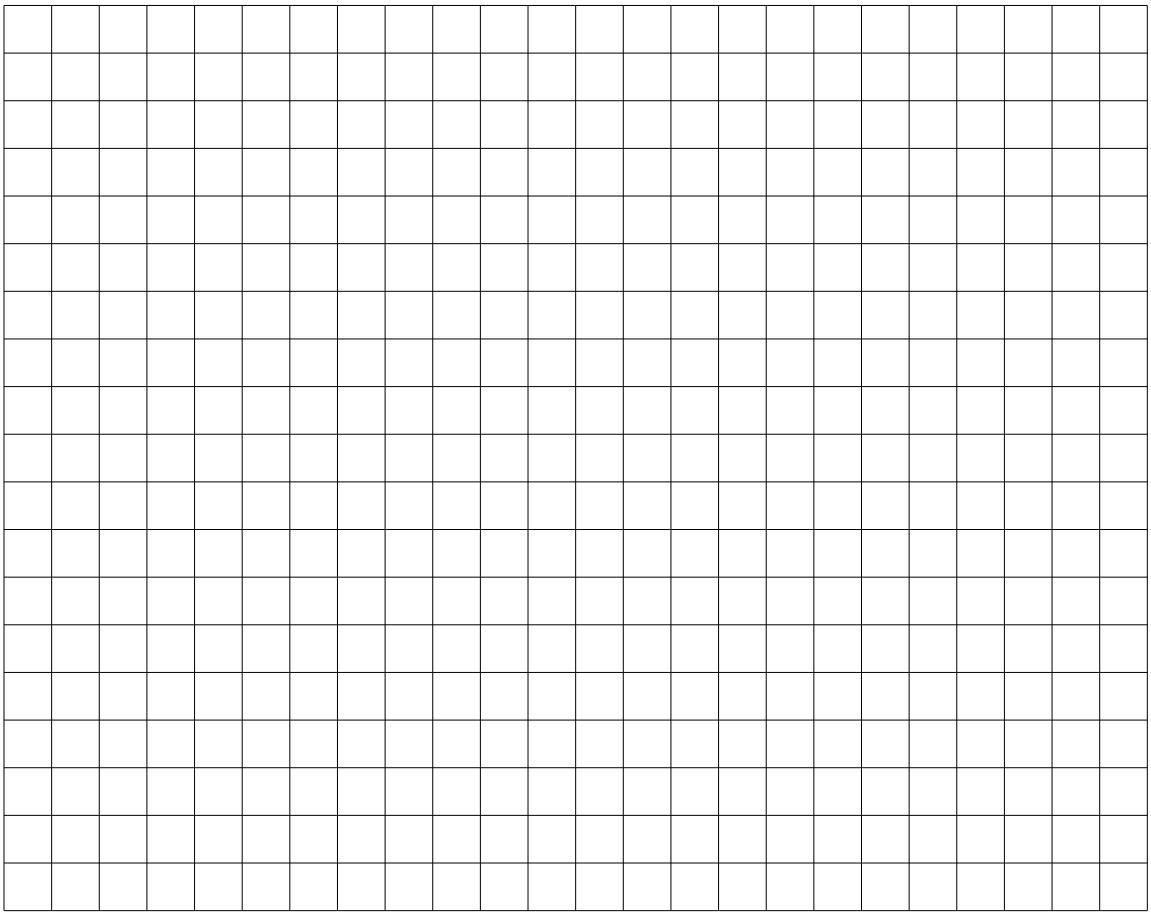
   Node (nodes) to remove: _____

2. **Specifications:**
   The procedure `measures (t_rbt` T`, entier` n`,` h`)` calculates the size (n) and height (h) of the 2-4 tree by represented the red-black tree T.

algorithm procedure `measures`
local parameters
`t_rbt T`
global parameters
`integer n, h`

variables

begin



end algorithm procedure `measures`

The algorithm will be called as follows:

```
n ← 0
h ← 0
measures(T, n, h)
```

***Answers 4* (Bipartite graph – *7 points*)**

1. ◦ Graph G_1 is bipartite: YES – NO

   Yes: $S_1 =$ _____ $S_2 =$ _____

   ◦ Graph G_2 is bipartite: YES – NO

   Yes: $S_1 =$ _____ $S_2 =$ _____

   ◦ Graph G_3 is bipartite: YES – NO

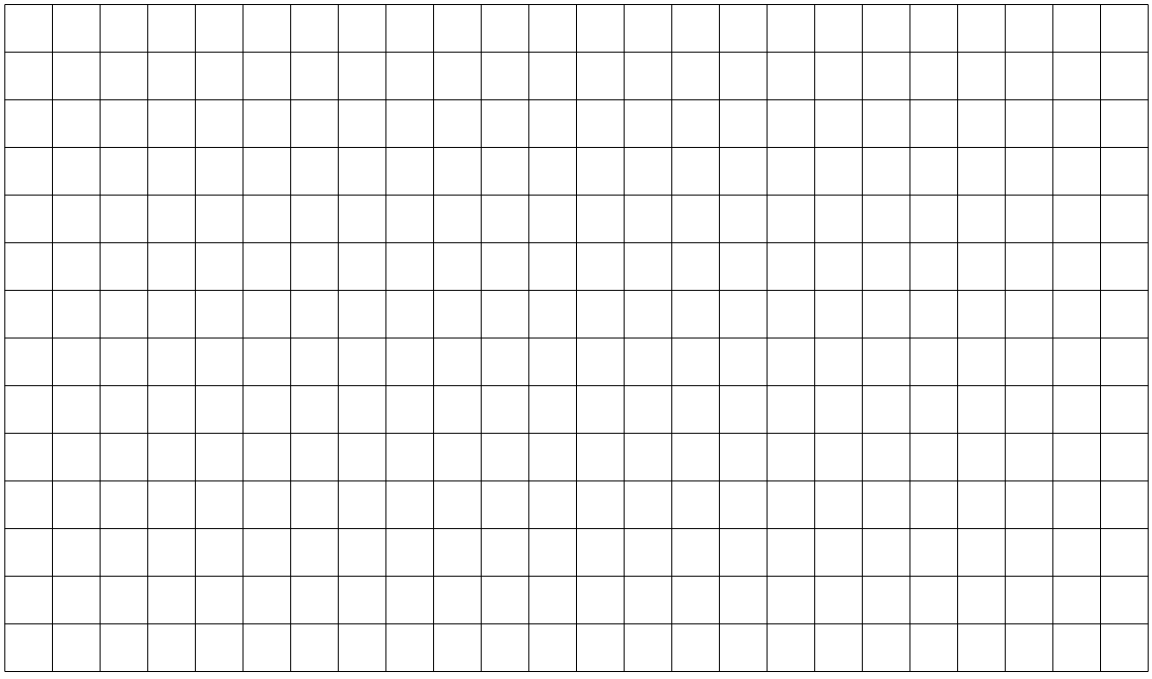
   Yes: $S_1 =$ _____ $S_2 =$ _____

2. **Specifications:**
   The function `bipartite (t_graph_dyn G)` tests whether the graph G is bipartite.
   Comment:
   This is the "calling function" of the recursive one you have to write next page.

```
algorithm function bipartite : boolean
    local parameters
        t_graph_dyn    G

    variables
        t_int_vect    M
        integer         i


begin
    for i ← 1 to G.order do
        M[i] ← 0
    end for
```



```
end algorithm function bipartite
```

Specifications:

The function `test_rec (t_listsom` *ps*`, t_int_vect` *M*`)` tests whether the subgraph traveled from the vertex pointed by *ps* is bipartite.

algorithm function `test_rec : boolean`

local parameters

`t_listsom ps`

global parameters

`t_int_vect M`

variables

begin

end algorithm function `test_rec`

***Answers 5* (What is this? – *5,5 points*)**

1. `build_graph`(G_4, `5, 2,` NG) :

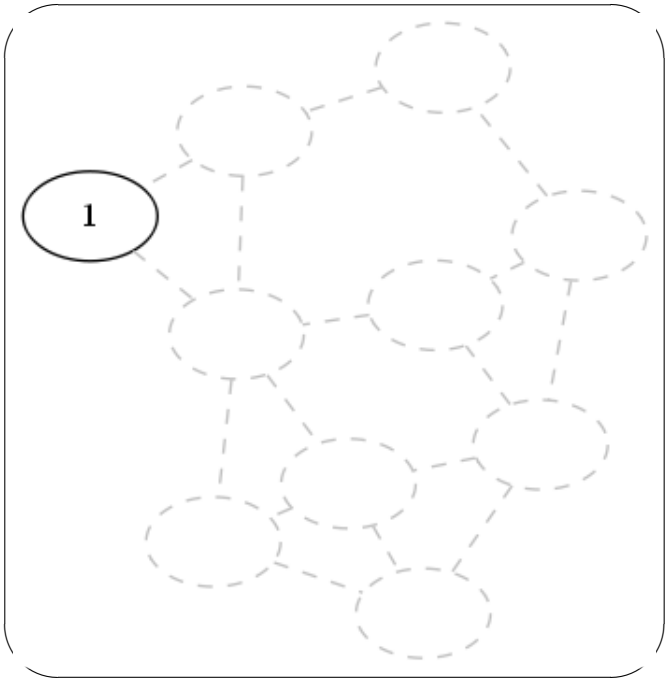
(a) `dist`

1	2	3	4	5	6	7	8	9	10

(b) `map`

1	2	3	4	5	6	7	8	9	10

(c) The built graph (NG):



2. `build_graph`(G, s, n, NG) (any G, $s \in G$, $n > 0$) :

(a) *What does the array* **`dist`** *represent?*

(b) *What is the array* **`map`** *used for?*

(c) *What does the graph NG represent?*