Algorithms and Programming

Iniziato	martedì, 21 dicembre 2021, 17:12
Stato	Completato
Terminato	martedì, 21 dicembre 2021, 17:12
Tempo impiegato	12 secondi
Valutazione	**0,00** su un massimo di 15,50 (**0**%)

Domanda 1

Risposta non data

Punteggio max.: 2,00

The following sequence of pairs is given. Each relation i-j means that node i is adjacent to node j. Node names are integer values within the range from 0 to 9.

```
3-1 4-1 1-6 0-4 3-9 6-9 5-0
```

Apply an online connectivity algorithm based on quick-union. Please, show the content of the array at the end of the entire process as a sequence of integer values separated by a single space. No other symbols must be included in the response. This is an example of the response: 0 3 0 6 8 etc.

Risposta:

La risposta corretta è : 6 6 2 1 1 9 9 7 8 9

Domanda 2

Risposta non data

Punteggio max.: 1,00

Given the following array of integer values, sort it in ascending order using the exchange sort procedure. Suppose that within this procedure, the main (outer) loop moves the higher value of the unordered array into its rightmost element.

```
15  9 18 11 -2  5  3  1  7  4  3  2  5
```

Display the content of the array just after 6 iterations of the main (outer) loop (i.e., before iteration number 7). Please, show the entire content of the array as a sequence of integer values separated by a single space. No other symbols must be included in the response. This is an example of the response: 0 3 0 6 8 etc.

Risposta:

La risposta corretta è : -2 1 3 4 3 2 5 5 7 9 11 15 18

Domanda 3

Risposta non data

Punteggio max.: 2,00

Given the following C recursive function:

```
int f (int *v, int l, int r, int k){
  int c;

  if (l > r)
    return (-1);

  c = (l+r) / 2;
  if (k < v[c])
   return (f (v, l, c-1, k));
  if (k > v[c])
    return (f (v, c+1, r, k));

  return c;
}
```

Write the recurrence equation describing the algorithm. Analytically, compute its asymptotic complexity in terms of number of operations. Please, report all computational steps required to reach the result and the final asymptotic complexity.

Domanda 4

Risposta non data

Punteggio max.: 1,00

Given the following array of integer values, sort it in descending order using the merge sort procedure.

```
1 15  2  8  3 14  5 19  7 18 10 11 12
```

Display the content of the array just before the last (and conclusive) merge step (the one delivering the final and sorted array). Please, show the entire content of the array as a sequence of integer values separated by a single space. No other symbols must be included in the response.

Risposta:

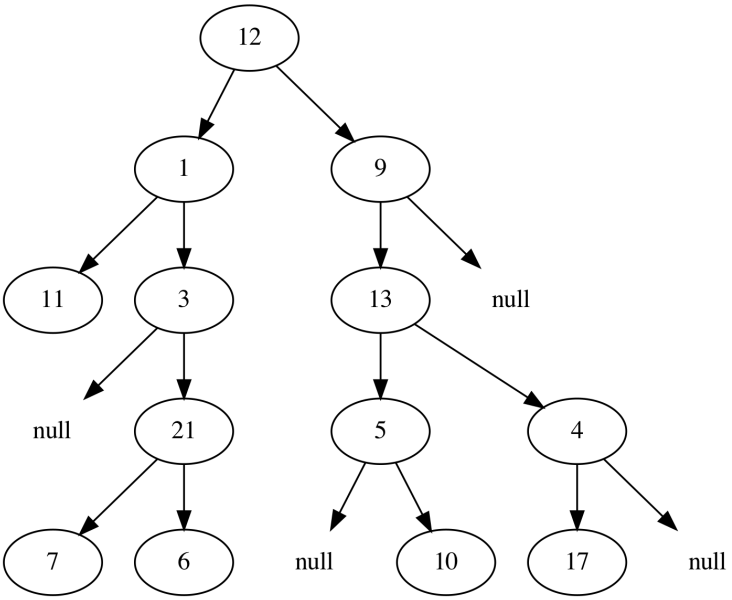
La risposta corretta è : 15 14 8 5 3 2 1 19 18 12 11 10 7

Domanda 5

Risposta non data

Punteggio max.: 0,50

The following binary tree is given.



Visit it in in-order.

Please, report the sequence of keys displayed by the visit on the same line and separate numbers with a single space. No other symbols must be included in the response. This is an example of the response format: 23 4 5 etc.

Risposta:

La risposta corretta è : 11 1 3 7 21 6 12 5 10 13 17 4 9

Domanda 6

Risposta non data

Punteggio max.: 1,50

Consider a binary tree with 15-nodes. Its visits return the following sequences.

```
Pre-orde
r:        E    I    P    X    M    S    T    Y    N    Z    D    L
   G    R    V
In-orde
r:         P    X    M    I    Y    T    S    E    D    Z    N    G
    L    V    R
Post-orde
r:       M    X    P    Y    T    S    I    D    Z    G    V    R
  L    N    E
```

Report the sequence of keys stored on the leaves of the tree, moving on the tree from left to right. Please, report the list of keys on the same line, separated by a single space. No other symbols must be included in the response. This is an example of the response format: A X C Y etc.

Risposta:

La risposta corretta è : M Y D G V

Domanda 7

Risposta non data

Punteggio max.: 1,50

Suppose to have an initially empty priority queue implemented with a minimum heap. Consider the following sequence of integers and "*" characters, where each integer corresponds to one insertion into the priority queue and each character "*" corresponds to one extraction.

```
19 21 19  2  1 15  5 *  *  *
```

Report the sequence of values as they are stored in the array representing the priority queue at the end of the entire process. Please, show the entire content of the array as a sequence of integer values separated by a single space. No other symbols must be included in the response. This is an example of the response: 0 3 2 6 8 etc.

Risposta:

La risposta corretta è : 15 19 19 21

Domanda 8

Risposta non data

Punteggio max.: 1,50

THIS EXERCISE IS ONLY FOR STUDENTS WITH 12 CREDITS IN THEIR CURRICULUM.

In an activity set, the i-th activity is identified by the pair [si, fi), where si is the starting time and fi is the finishing time.
The following is a correct set of activities.

```
 P1   7   9
 P2  21  23
 P3  20  24
 P4   4   5
 P5  15  17
 P6   0   3
 P7   6   7
 P8  27  31
 P9   8  12
P10  26  32
P11   3   8
P12  29  31
P13   9  11
```

Using a greedy algorithm, find the largest subset of mutually compatible activities. Please, report the set of compatible activities in the same order they have been selected separated by a single space. No other symbols must be included in the response. This is an example of the response: 0 3 2 6 8 etc.

Risposta:

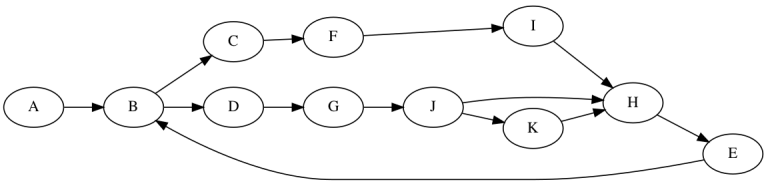
La risposta corretta è : 6 4 7 1 13 5 2 8

Domanda 9

Risposta non data

Punteggio max.: 1,00

Visit the following graph in breadth-first, starting at node A.
When necessary, consider nodes and edges in alphabetic order.



Display the minimum distance of all vertices from the starting one. Please, indicate the distance of all vertices sorted in alphabetic order (i.e, display the distance for A B C D, etc.). Report a sequence of integer values separated by one single space. No other symbols must be included in the response. This is an example of the response: 0 3 2 6 8 etc.

Risposta:

La risposta corretta è : 0 1 2 2 6 3 3 5 4 4 5

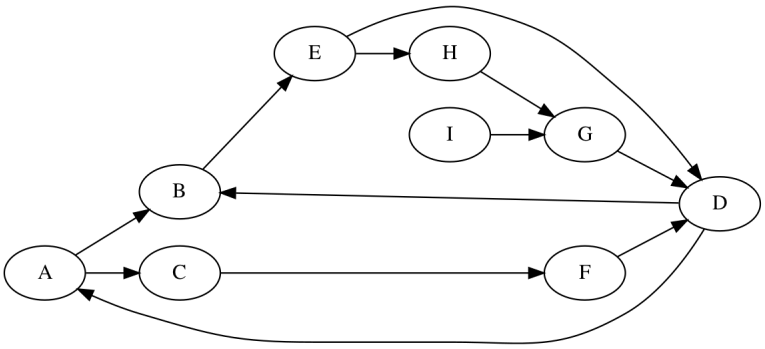
Domanda 10

Risposta non data

Punteggio max.: 1,50

THIS EXERCISE IS ONLY FOR STUDENTS WITH 10 CREDITS IN THEIR CURRICULUM.

Visit the following graph in depth-first, starting at node A. Label each edge as tree (T), back (B), forward (F), and cross (C).
When necessary, consider nodes and edges in alphabetic order.



Report the label of the edges DB, CF, and IG in this order. Please, indicate the edge type of these 3 arcs with a single letter, i.e., T, F, B, C, separated by single spaces. No other symbols must be included in the response. This is an example of the response: F T B

Risposta:

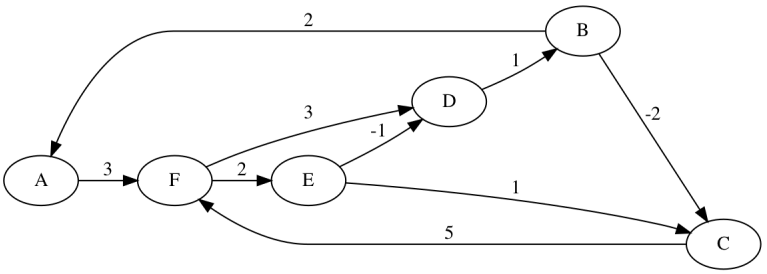
La risposta corretta è : B T C

Domanda 11

Risposta non data

Punteggio max.: 2,00

Given the following directed and weighted graph, apply Bellman-Ford's algorithm to find all shortest paths connecting node A with all the other nodes.
When necessary, consider nodes and edges in alphabetical order.



Report the shortest paths to all vertices. Please, indicate the shortest path to all vertices sorted in alphabetic order (i.e, display the shortest path for A B C D etc.). Report a sequence of integer values separated by one single space. No other symbols must be included in the response. This is an example of the response: 0 3 2 6 8 etc.

Risposta:

La risposta corretta è : 0 5 3 4 5 3