Answers of Algorithms and Data Structures, Exam 28 May 2018

The questions start on page 5.

It is strongly preferred that you fit your answers on these sheets. If you really must, you can use a separate sheet of paper instead. Please indicate that clearly.

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	1a	1b	1c	1d	1e	1f	1g	2a	2d	2e	2f	3a	3b	3d	3f	3h	3i	3j
A						X		X						X	X	X	X	
B		X	X				X		X									
C				X	X							X						
D	X									X			X					X

MSc students receive no credit for 3j. BSc students receive no credit for 3i.

2b

3 2 1 0 4 3 2 1

2c

a = | 5 | 6 | 0 |

sz = 1

2g

```
public boolean isEmpty() {
    return (sz==0);
}
```

2h

```
public void remove_oldest{
    shift();
}
```

2i

Use a doubly linked list of no more than capacity many nodes. ('capacity' needs to be an instance variable.) 'push' adds a new node at the beginning of the list (referenced by 'first'). If sz == cap then remove the node at the end (referenced by 'last').

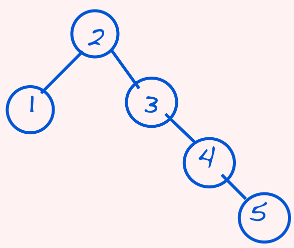
Example for capacity = 3:

last -> [1] <=> [2] <=> [3] <- first

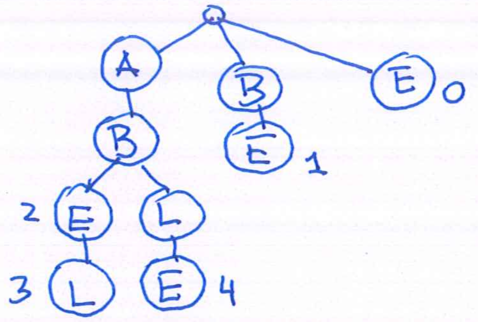
push('4'):

last -> [2] <=> [3] <=> [4] <- first

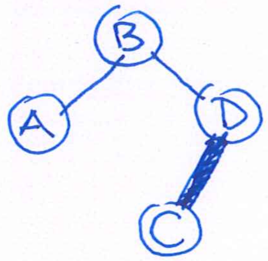
3c



3e



3g



4a

Create an undirected, unweighted graph as in [SW, §4.1]. For each vertex u, perform BFS from u [SW, alg. 4.2] (This computes the distance $d(u,v)$ for every other vertex v.) Add these distances, i.e., compute $\sum_u \sum_v d(u,v)$. Divide the result by 2.

Running time: A computations of BFS (one for every u). Total time

$$O(A(A+B)).$$