CPS 130 Homework 17
Amortized Analysis

due Thu June 13th

Write and justify your answers in the space provided.[1]

1. In this problem we consider two stacks A and B manipulated using the following operations (n denotes the size of A and m the size of B):

    - $PushA(x)$: Push element x on stack A.
    - $PushB(x)$: Push element x on stack B.
    - $MultiPopA(k)$: Pop $\min\{k, n\}$ elements from A.
    - $MultiPopB(k)$: Pop $\min\{k, m\}$ elements from B.
    - $Transfer(k)$: Repeatedly pop an element from A and push it on B, until either k elements have been moved or A is empty.

    Assume that A and B are implemented using doubly-linked lists such that *PushA* and *PushB*, as well as a single pop from A or B, can be performed in $O(1)$ time worst-case.

    (a) What is the worst-case running time of the operations *MultiPopA*, *MultiPopB* and *Transfer*?

(b) Define a potential function $\Phi(n, m)$ and use it to prove that the operations have amortized running time $O(1)$.