(17.1-2) If the register \( A \) consists of all ones, calling the the \textsc{Increment} function causes the register to roll-over to all zeros. It’s reasonable, then, to implement the \textsc{Decrement} function so that when it is applied to an all-zero register, it rolls-back to all ones. Therefore, starting with an all-zeros register, a sequence of \( n \) alternating calls \textsc{Decrement}, \textsc{Increment}, \textsc{Decrement}, etc. will result in the worst case, each setting or re-setting all \( k \) bits on each call. Therefore, the running time will be \( \Theta(nk) \).

(17.2-1) For a simple stack with \textsc{Pop}, \textsc{Push}, and \textsc{Copy} operations, we just need to charge $2 for the \textsc{Pop} and \textsc{Push}, $1 for the operation itself, and $1 to put in the “bank” to cover the cost of the \textsc{Copy}. Since the stack size is at most \( k \), the \textsc{Copy} costs at most $k$, which will have been accumulated in the bank from the \( k \) \textsc{Pop} and \textsc{Push} operations.

(17.4-3) Suppose operation \( i \) is a \textsc{Delete} that causes a table contraction. Then \( num_i = num_{i-1} - 1 = (1/3)\text{size}_{i-1} - 1 \) and \( \text{size}_i = (2/3)\text{size}_{i-1} \). The amortized cost of \textsc{Table-Delete} is

\[
\hat{c}_i = c_i + \Phi_i - \Phi_{i-1} \\
= (num_i + 1) + \Phi_i - \Phi_{i-1} \\
= (num_i + 1) + 2 \cdot \text{num}_i - \text{size}_i - |2 \cdot \text{num}_{i-1} - \text{size}_{i-1}| \\
= (num_i + 1) + 2 \cdot ((1/3)\text{size}_{i-1} - 1) - (2/3)\text{size}_{i-1} \\
-2 \cdot ((1/3)\text{size}_{i-1} - \text{size}_{i-1}) \\
= (num_i + 1) + |2| - |(1/3)\text{size}_{i-1}| \\
= (num_i + 1) + 2 - (1/3)\text{size}_{i-1} \\
= (1/3)\text{size}_{i-1} + 2 - (1/3)\text{size}_{i-1} \\
= 2
\]

If the operation does not cause a contraction, then

\[
\hat{c}_i = c_i + \Phi_i - \Phi_{i-1} \\
= 1 + \Phi_i - \Phi_{i-1} \\
= 1 + 2(num_{i-1} - 1) - \text{size}_{i-1} - |2 \cdot \text{num}_{i-1} - \text{size}_{i-1}|
\]
We conclude that the amortized cost of Table-Delete is bounded by a constant.