Problem

This is false. Consider the graph G with nodes s, a, b, c, d, t. There is an edge from node s to nodes a, b, c an edge from nodes a, b, c to node d all with a capacity of 1, and then an edge from node d to node t with a capacity of 4. Right now a minimum cut of A = s and B = everything else has a value of 3. But if we increase each edge by 1, then A has a value of 6. But now the minimum cut where B = t and A is the rest of the graph has a value of 5. So we have shown a counterexample.