Computer Assignment 3

Question 1

Suppose we have both arcs (s, i) and (i, t) with capacity ai and bi, when doing the max flow, there will be a flow going through (s, i) and (i, t) with capacity Min (ai, bi). Hence, by subtracting Min (ai, bi) from the capacity of arcs (s, i) and (i, t), it will make one of the capacity becomes zero and the other becomes non-negative.

Questions 2

By strong law of duality, if there exists an optimal solution to the max flow problem, the solution will be the same as optimal solution in the min-cut problem. Since the min-cut problem is a s-t cut problem finding the minimum cut between the partition of s and t. In the labeling problem, all the pixels belong to partition of s will be assigned to foreground and all the pixels belong to partition of t will be assigned to background. There will be a penalty only if the neighboring pixels are in different partitions. Hence, the min-cut problem will solve the labeling problem by finding out the minimum cuts between two partitions.

Question 5

We will divide the arcs into four categories: the super source s, the super sink t, arcs have a positive ai value as A and nodes have a positive bi value as B. Suppose we found a shortest path s-A1-B1-t which A1 belongs to A and B1 belongs to B. After we exhaust the path, we will drop one arc with minimum capacity. If arc (s, A1) is dropped, we will go back to s and find a node belongs to A. If either arc (A1, B1) or (B1, t) is dropped, we will go back to A1 directly and start to try A1’s neighbor. To make it easier, we will only try A1’s neighbor only if the neighbor has an arc to the super sink. To do it, we will make sure we always find a path with length of 3.