**Algorithms 2 Assessed exercise report**

Task 1

Status report

Functions as specified.

Justification of operation

isFlow checks each edge to see if the flow is below the capacity, then checks each vertex to see if the incoming flow is equal to the outgoing flow except for the source and sink vertices which respectively have no incoming and no outgoing flow.

getValue relies on the fact that the total flow of a network is equal to the sum of the flows on the efferent edges of the source so it simply calculates this

printFlow simply loops over all the edges via the adjacency matrix and prints out the labels, capacity and flow of each edge

Task 2

Status report

Functions as specified.

Justification of operation

The ResidualGraph constructor builds the residual graph for a network by checking each edge. A backwards edge will be added if there is a possibility of reducing the flow through the edge and a forwards edge will be added if the edge still has capacity for more flow.

findAugmentingPath looks for a path connecting the source to the sink in the residual graph. If such a path exists it finds it via a breadth first search. This is accomplished using a queue which will take as first input the vertices adjacent to the source and check if any are the sink vertex. If so then the path is found otherwise a vertex will be removed from the queue and its adjacent vertices added and checked and so on until the sink is found. An array of predecessors for each vertex is used to reconstruct the path and to ensure there is no useless searching by eliminating any path which would go through a vertex which already has a predecessor. A stack is used to reconstruct the path as looking through the predecessors array will give the path in reverse order. The path is then reconstructed in the correct order by popping elements from the stack into the path list.

augmentPath calculates the maximum flow to increase by by checking for the limiting flow in the input path. It then adds this flow to forwards edges and removes it from backwards edges.

fordFulkerson keeps trying to augment the network by creating the residual graph then finding an augmenting path and augmenting along it until no augmenting path can by found

Task 3

Status report

Functions as specified.

Justification of operation

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Task 4

Status report

Functions as specified.

Justification of operation