Jin-Ao Olson Zhang
Z5211414
Question2:

Suppose we have M roads from warehouses to shops, lets sort all the roads by their time cost di
Complexity O(M log(M))

First create a biparite graph,let n warehouse and n shops be the vertices (all warehouses in the sam side and shops in the other side)

For every road i from warehouse j to shop k, link an edge from warehouse j to shop k, edge cost is di.

Create a super source linked to all the warehouses ,only one truck located at one warehouse, ci = 1.

Create a super sink linked to all the shops ,ci = 1

Use binary search to find the first di
First di = d (M/2) :

1. If their exit a road j has dj < di, cj = 1 else cj = 0
2. Use max-flow algorithm to find the max-flow, if max-flow == n,which means time di can send all the trucks to all the shops,but that time may not be the shortest cost.
so if equals to n,keep binary search the smaller half,else keep binary search the larger half
3. Use binary search to get the next di and repeated step 1,2 until find the smallest time (if only three element a b c in the binary search and max-flow b == n, if max-flow a !=n,b is the smallest)
4. That time is the shortest time until all shops are supplied

Complexity max-flow algorithm * binary search = O(n^3) * O(log(M)) = O(n^3 log(M))

Total time complexity O(M log(M)) + O(n^3 log(M))