FLOW BEHIND ENEMY LINES

Description

Find a maximum flow and the corresponding minimum cut in a flow network that describes the railway system of the Eastern Bloc during the Cold War.

You are an analyst in a governmental intelligence agency. Using your cunning skills you have collected information about the capacities of the enemy's railroad network. You task is to identify the network's maximum capacity and (simultaneously, by the max flow–min cut theorem) its bottleneck.

Input

There is a single input file for this lab, called "rail.txt". The syntax is:

- on the first row, the number of nodes n,
- n rows containing the names of nodes $0..n$-1. (These names are not unique, so you can't use them as keys.)
- one row containing the number of arcs m
- m rows on the form a b c, where a and b are node indices (betwenn 0 and n-1), and c is a capacity. Capacity -1 means that the capacity on that edge is infinite (probably either because that part of the railway has really, really high capacity, or that your spying attempts in that area were foiled by a beautiful Russian superspy of the opposite sex). Arcs are undirected.

Output

Output the maximum flow from the node called ORIGINS to called DESTINATIONS, which should be 163, and the "bottleneck" as a list of arcs.
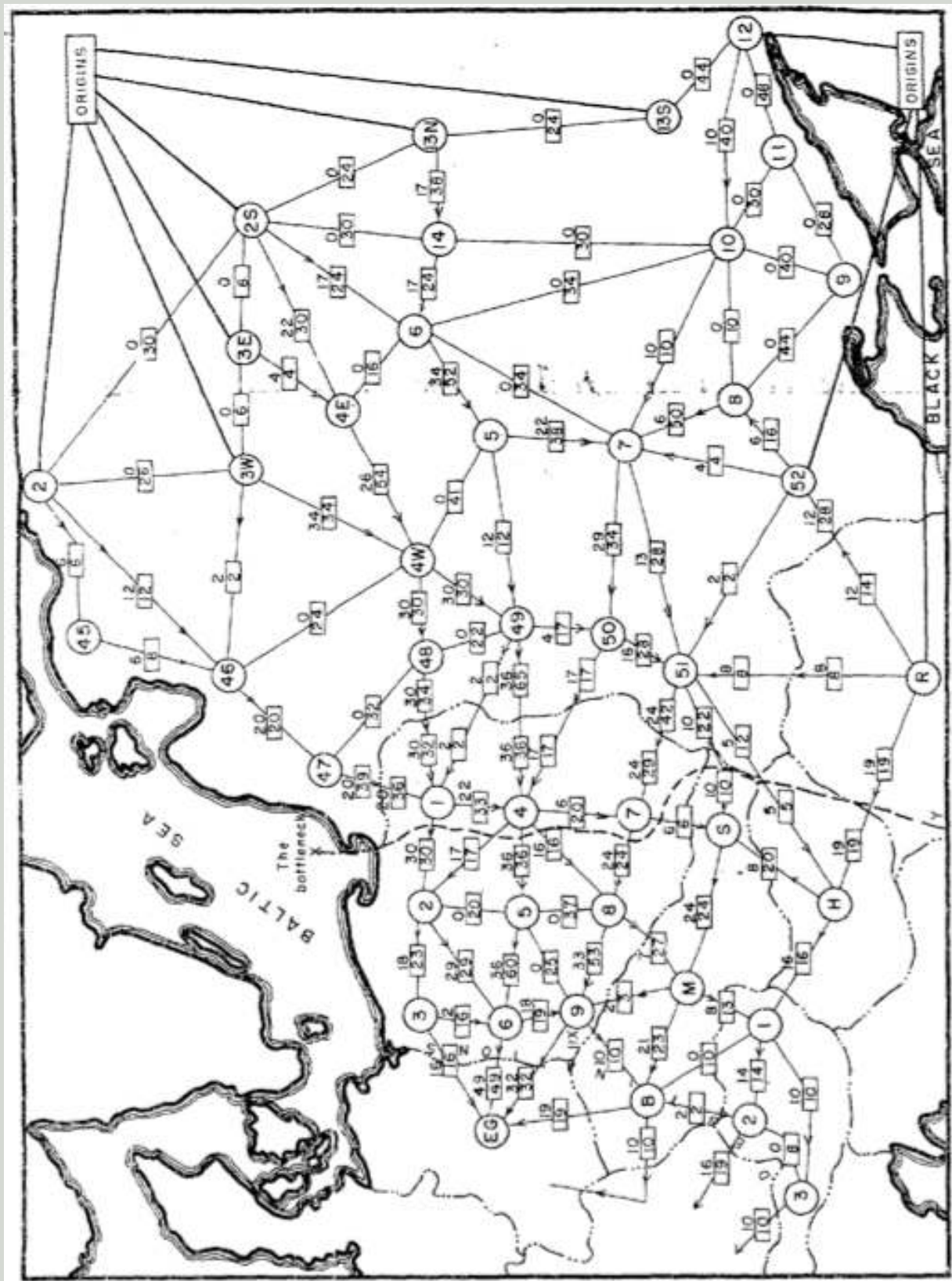
```
55
ORIGINS
2
2S
13N
...
EG
DESTINATIONS
120
0 1 -1
0 17 -1
...
52 51 8
51 50 2
50 53 19
47 54 -1
48 54 -1
...
```

NOTICE: THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 and 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

The input railway network, from T. E. Harris, F. S. Ross, "Fundamentals of a Method for Evaluating Rail Net Capacities", US Air Force Project RAND research memorandum RM–1573, October 24, 1955, declassified on 13 May 1999. You can find the original document on the net at
oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=AD0093458
Cool stuff. Print it and leave it on your desk, to impress friends and family.