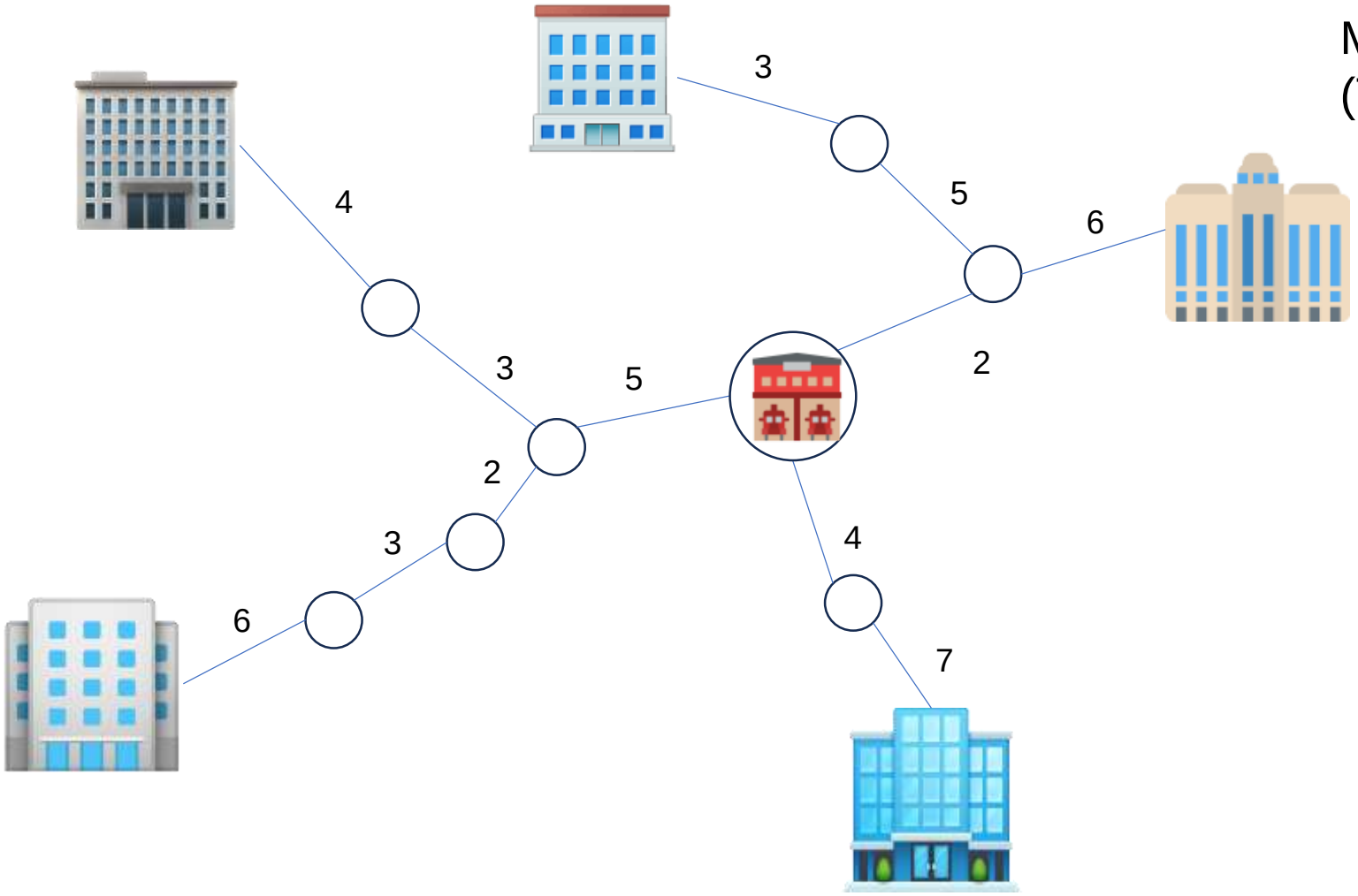
Problem Solving Practice
HW Problem #5

CSE4152
Sogang University

One Fire Station

Gotham City has a tree-like structure where buildings (houses) are connected by roads. In this layout, interior nodes of the tree represent road intersections, while terminal nodes represent buildings. The distance between any pair of nodes is defined as the Euclidean distance along the path (sequence of roads) connecting them. Due to villain activity, all fire stations in the city have been destroyed. Batman has decided to donate a new fire station and wants to place it at the optimal location in the city. The goal is to position the fire station such that its maximum distance to any building is minimized. Design an algorithm to find the best location for the fire station, and analyze its time and space complexities.

One Fire Station (cont'd)



Maximum distance = 5 + 2 + 3 + 6
(This case might not be optimal)

Example

Input :

5

1 2 3

2 3 3

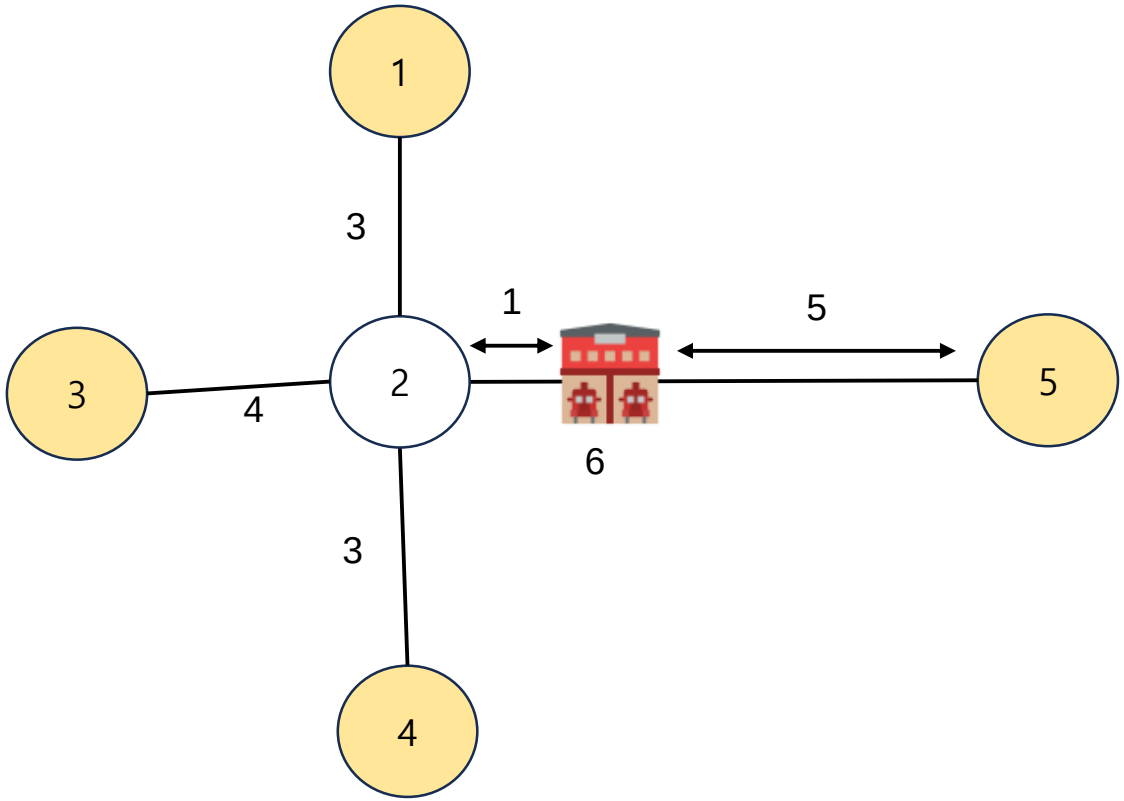
2 4 4

2 5 6

Answer:

5.0

One Fire Station (cont'd)

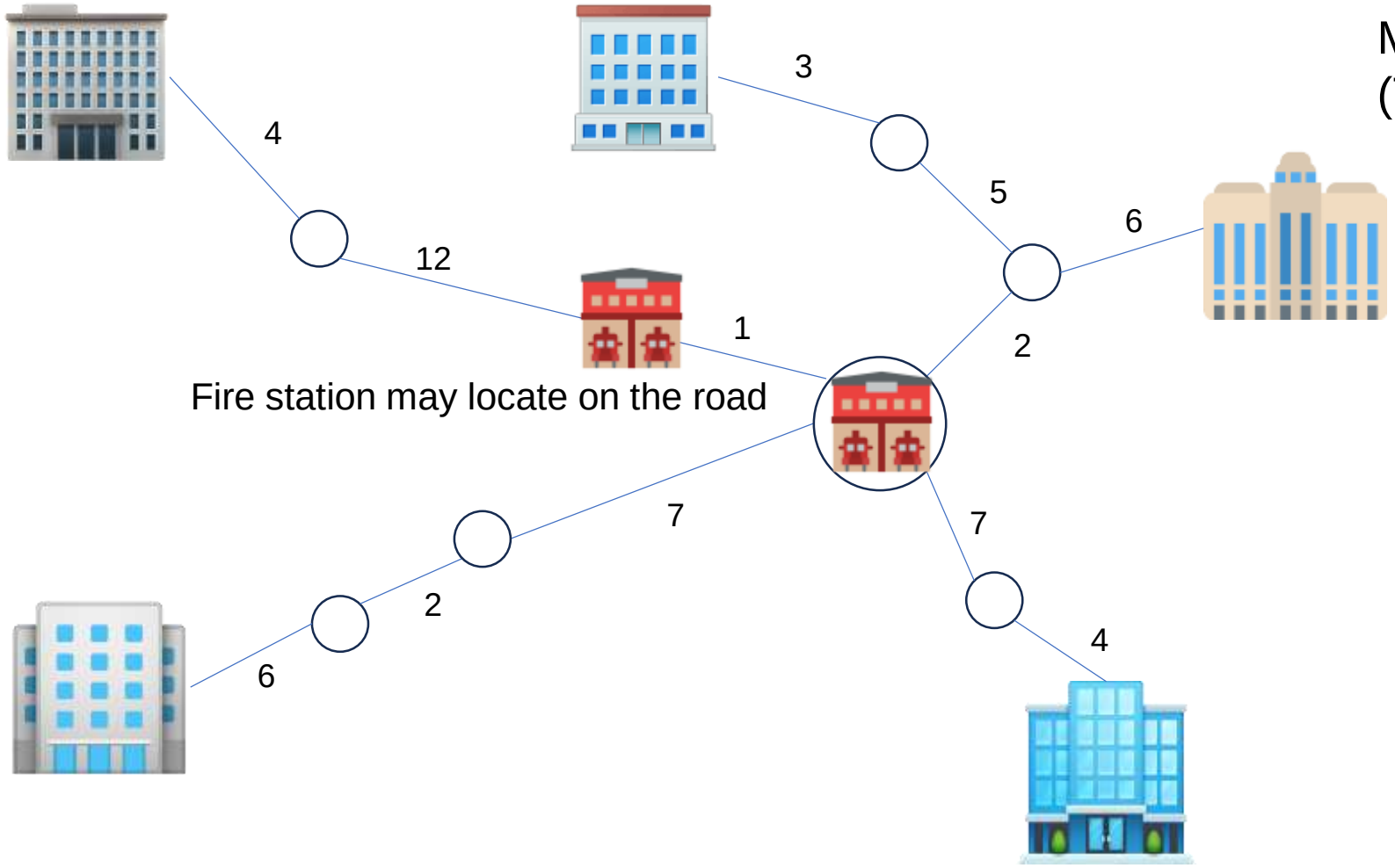


Maximum distance = 5

Two Fire Stations

Batman realized that a single fire station might not be sufficient for Gotham City. He decided to donate two fire stations instead. The goal remains to position these fire stations optimally, using the same criterion as before: minimizing the maximum distance from any building to its nearest fire station. Design an algorithm that finds the best locations for two fire stations, and analyze its time and space complexities.

Two Fire Stations (cont'd)



Maximum distance = 12 + 4
(This case might not be optimal)

Example

Input :

4

1 2 3

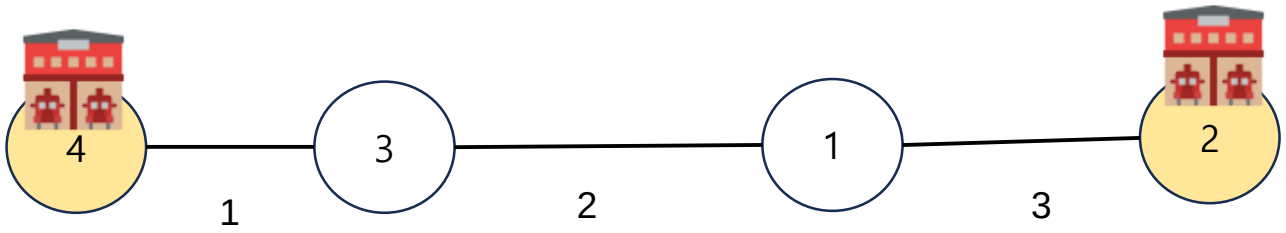
1 3 2

3 4 1

Answer:

0.0

Two Fire Stations (cont'd)



Maximum distance = 0