Discrete Event Simulation for Pandemics

Consider an undirected graph G=(V,E) representing a population. Nodes of the graph are individuals. The presence of an edge between two individuals indicates that they are in close contact with each other (e.g, sharing a home or a workplace).
Generate a graph on 100 nodes as follows: for each pair of nodes, toss a fair coin and put an edge between them if and only if you get a heads. This gives you a population graph.
Every individual is in one of the following states: susceptible, infected, or recovered (aka removed). The possible transition for each individual is *susceptible* to *infected* to *recovered*.

- Data Structures:
    - Sets **S, I** and **R.**
    - Binary heap with nodes having
        - **Node id**
        - **TimeStamp**
        - **Event type: Infection/Recovery**
- Initially all nodes are in S**.**
- Choose a starting node arbitrarily and call it **u.**
- **Insert** this infection event in the min-Queue **Q, with timestamp 0.**
- **While(;;)**
    - **e<-DeleteMin(Q)**
    - If **e** is a Recovery event,
        - **R<- R U {e.nodeID}**
        - **I<- I\{e.nodeID}**
    - **If e** is an infection event,
        - **I<- I U {e.nodeID}**
        - **S<- S\{e.nodeID}**
        - **Forall susceptible** neighbors **u** of **e.nodeId**
            - **Generate an infectionTime as follows**
                - Toss a fair coin five times
                - Let **j** be the first time a head comes (if a head doesn't appear at all, **u** doesn't get infected because of **e.nodeid**), ***continue*** to next neighbor
            - **Insert** into **Q:**
                - **Node id:u**
                - **TimeStamp: e.timeStamp+j**
                - **Event type: Infection**
            - (If **u** did get infected) **generate recovery event:**
                - Generate a random number **k** uniformly between **e.timeStamp+j** and **e.timeStamp+j+5**
            - **Insert into Q:**
                - **Node id:u**
                - **TimeStamp: k**
                - **Event type: Recovery**

1. Plot the number of susceptible, infected and recovered individuals, against **i.**
2. Compare the instant at which a node gets infected with it’s shortest distance from the start node s.