Solutions to Chapter: Mod 10

1. A

In rich get richer phenomenon a node having high degree attracts more nodes to make connections with it.

2. B

If we plot percentage usage of the words versus words sorted as per their usage, it follows Zipf's law. For more details, watch the 2nd video of the week 10.

3. D

According to the research, if your friend is obese, the chances of you being obese is increased by 45%, and if your friend's friend is obese, the chances of you being obese is increased by 25%, and if your friend's friend's friend is obese, the chances of you being obese is increased by 12%.

4. A

In the figure, the node u is infected and it has k children. The probability that the node u infects one of its neighbors is p. So, the expected number of neighbors infected in the next round can be computed as:

$$E[X] = p + p + ... \ (k \text{ times})$$
$$E[X] = p \cdot k$$

5. C

SIR is the short name for the Susceptible-Infected-Recovered model. It is also called Susceptible-Infected-Removed.

6. B

In SIR model, if a node is recovered once, it will not be infected in any of the next iteration. So, the probability of it getting infected again is 0.

7. B

If the people are again susceptible to get infected then the people can be categorized into two categories: 1. Susceptible, and 2. Infected. So, this scenario can be modeled using **SI (Susceptible-Infected)** model.

8. A

In branching process, the reproductive number is greater than 1 ($R_0 > 1$), if the disease persists in the network with some positive probability ($p > 0$).

9. A

In branching process, the probability q_n that the infection reaches the level n is recursively defined as, $q_n = 1 - (1 - p \cdot q_{n-1})^k$, where k represents the number of children and p represents the probability with that a node infects one of its neighbors.

10. B

In a network, an idea and a disease both are spread in different ways. In the case of the disease, the node does not have any option to adopt it as the node can automatically be infected with some positive probability if it comes in the contact of an infected node. The second point is, in the case of disease, the spreading pattern is invisible as the infected node does not know that it was infected by which of its neighbor.