

## Assignment Week 11

### Social Networks

1. In the Milgram's small world experiment, what was the average number of hops in which the letters reached the target?
  - a. 4
  - b. 5
  - c. 6**
  - d. 7

**Explanation:** In Milgram small world experiment, the average number of hops was 6, hence the name 'six degrees of separation' that was given.

2. In small world networks of size  $n$ , the average distance between any two random nodes is given by
  - a.  $O(n \log n)$
  - b.  $O(\log n^2)$
  - c.  $O(n)$
  - d.  $O(\log n)$**

**Explanation:** Mathematically, small world networks of size 'n' have an average distance  $O(\log n)$ , meaning that between any two random nodes, the expected distance is  $O(\log n)$ .

3. Which of the following correctly represents a Watts-Strogatz model on 'n' nodes in 2 dimensional space?
  - a. 'n' nodes arranged in 2-D lattice where the connections between the nodes are all random.
  - b. 'n' nodes arranged in a 2-D lattice where every node is connected to every other node.
  - c. 'n' nodes arranged in a 2-D lattice where every node is connected to the nodes on its left, right, top, bottom and diagonally opposite
  - d. 'n' nodes arranged in a 2-D lattice where every node is connected to the nodes on its left, right, top, bottom and diagonally opposite, and, some edges are randomly laid in the network between any two nodes.**
4. In decentralized search,
  - a. Only the strong ties are required.
  - b. Only the weak ties (long range contacts) are required.

**c. Both the strong as well as the weak ties are required.**

d. None of the above

**Explanation:** In decentralized search, the strong ties help one to better explore a region. On the other hand, the weak ties allow one to search far away regions of the network. Hence, both of them are required.

5. Choose the correct statement

**a. Watts-Strogatz model resembles a ring in 1 dimension and a grid in 2 dimensions.**

b. Watts-Strogatz model resembles a grid in 1 dimension and a ring in 2 dimensions.

c. Watts-Strogatz model resembles a ring both in 1 dimension as well as 2 dimensions.

d. Watts-Strogatz model resembles a grid both in 1 dimension as well as 2 dimensions.

6. Random rewiring in small world generative model refers to

a. Addition of an extra edge in the network

b. Deletion of a random edge in the network

**c. Deletion of a random edge from the network and addition of a new edge in the network**

d. None of the above

7. Assume that each of your friends has 100 friends other than you. Similarly, each of their friends has 100 friends other than them and so on. Then, how many people can you reach in  $i$  levels (Level one refers to your friends, level 2 refers to your friends' friends and so on)?

a. 100

b.  $100^{(i+1)}$

c.  $100^{(i-1)}$

**d.  $100^i$**

**Explanation:** In 1 level, we can reach 100 friends. In level 2, each of the 100 friends make us reach another 100 friends, so we reach  $100^2$  friends. In level 3, each of the  $100^2$  friends make us reach 100 more friends; hence we can reach  $100^3$  friends. Similarly, at the level  $i$ , we can reach  $100^i$  friends.