SOCIAL NETWORKS - NPTEL July 2024

Week 2

1. Which of the following statements is/are True?

   Statement I - Web graph is a directed network.
   Statement II - Facebook friendship network is an undirected network.

   (a) I only
   (b) II only
   (c) Both
   (d) None

   Answer: (c)

   Explanation: Statement I: The web graph is a directed network because hyperlinks between web pages have direction (from one page to another).

   Statement II: The Facebook friendship network is an undirected network because friendships are mutual (if A is friends with B, then B is also friends with A).

2. What is the clustering coefficient of a node that has 6 neighbors and 3 connections between those neighbors?

   (a) 0.2
   (b) 0.5
   (c) 0.75
   (d) 0.9

   Answer: (a)

   Solution: For a node with 6 neighbors, there can be a maximum of (6 choose 2) = 15 possible connections among those neighbors. If 3 out of those 15 connections actually exist, the clustering coefficient is calculated as the ratio of the actual connections to the maximum possible connections, which is $3/15 = 0.2$.

3. Name the method used to read dataset in 'txt' format.

   (a) $read\_gml()$
   (b) $read\_edgelist()$
   (c) $read\_txt()$
   (d) $read\_gexf()$

   Answer: (b)

4. Given a complete graph with 120 vertices, what is the diameter of the Graph?

   (a) 0
   (b) 1
   (c) 2
   (d) 3

   Answer: (b)

   Explanation: In a complete graph, every vertex is directly connected to every other vertex by a single edge. Therefore, the shortest path between any two vertices is always 1, making the diameter of the graph 1.

5. Which statement accurately reflects the characteristics of node degrees according to Power law?

   (a) every individual in a social network has an equal number of connections
   (b) exhibit a uniform distribution of connections among all users
   (c) a small number of individuals have a substantially higher number of connections compared to the majority
   (d) each node has an identical degree, promoting equality in connectivity.

   Answer: (c)
   Lecture: 21

6. Given is a graph G with $|V| = n$ number of nodes and $|E|$ number of edges. In which of the following cases, we can guarantee that G is connected?

   (a) $|E| = n$
   (b) $|E| = n - 1$
   (c) $|E| = n(n-1)/2$
   (d) $|E| = n \log_2 n$

   Answer:(c)
   Lecture 25-28:58
   Solution: A graph with n(n-1)/2 edges is a complete graph and hence connected. With log n edges, we can't always guarantee connectedness, though the graph will be connected with a high probability.

7. Which of the following statements is True for GML format of networks?
   Statement I: Labels and attributes can be added
   Statement II: Weights can be added

   (a) I only
   (b) II only
   (c) Both
   (d) None

   Answer:(c)
   Lecture: 19

8. What is the reason for a path between words like "love" and "hatred" in the synonymy network?

   (a) faulty edges
   (b) contradictory paths to find antonyms
   (c) The network algorithm identifies unrelated words as synonyms
   (d) Words can undergo semantic shifts, acquiring new meanings or evolving to represent opposite concepts

   Answer: (d)
   Lecture: 16

9. Given a graph with 5 nodes and 8 edges, find the density of the graph. Hint: Answer with two digits precision
   Answer: 0.80
   Solution: Density of the graph = Number of edges/ Maximum possible edges for the graph =8/5C2 = 8/10=0.80

10. For any vertex v in an undirected (without loop, multiple edges) , the clustering coefficient of v ranges from:
    A. -1 to +1
    B. 0 to 1
    C. $-\infty$ to $+\infty$
    D. 0 to $+\infty$

    Answer: (b)
    Solution: If there are no edges between the neighbors of the vertex v, then cc(v) = 0. On the other hand, if all its neighbors are connected to each other, then cc(v) = 1.