Assignment Week 12

Social Networks

1. Which of the following statements defines the k-shell of a graph?
   a. **the subgraph induced by edges in the k-core and not in the k+1-core.**
   b. the subgraph induced by edges in the k+1-core and not in the k-core
   c. the subgraph induced by edges in the k-core and not in the k-1-core.
   d. the subgraph induced by edges in the k-1-core and not in the k-core
2. An Internet meme is
   a. A piece of text traversing through the Internet.
   b. An image traversing through the Internet.
   c. A video traversing through the Internet.
   d. **Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format.**
3. Whether a meme will go viral or not depends on
   a. **The quality of the meme and structure of the network**
   b. Only on the quality of the meme
   c. Only on the structure of the network
   d. Neither on the quality of the meme nor on the structure of the network.
4. The nodes which should be initially infected in a network in order to make an Internet meme go viral should have
   a. High degree
   b. High betweenness
   c. High closeness
   d. **High coreness**

Explanation: If a cascade is started with the nodes having highest coreness, it infects maximum number of people at the end.

5. The i^{th} iteration of k-shell decomposition algorithm
   a. Removes all the nodes of degree i from the graph.
   b. Recursively keeps removing the nodes of degree i from the graph, i.e., keeps removing the degree i nodes from the graph till there are no degree i nodes in the graph.
   c. **Recursively keeps removing the nodes of degree ≤ i from the graph, i.e., keeps removing the node of degree ≤ i from the graph till there are no degree ≤ i nodes in the graph.**
   d. Recursively keeps removing the nodes of degree ≥ i from the graph, i.e., keeps removing the node of degree ≥ i from the graph till there are no degree ≥ i nodes in the graph.

6. The nodes of degree 1 in a graph
    a. **Will always belong to 1-core.**
    b. Will always belong to 2-core.
    c. Can belong to any core.
    d. Will always belong to the innermost core of the network.

Explanation: Any node of degree 1 will be always removed in the first iteration of k-shell decomposition and hence will always belong to 1-core.

7. Choose the correct statement from the following
    a. Both the core and periphery of a network are the nodes which are removed during the first iteration of k-shell decomposition algorithm.
    b. Core of a network are the nodes removed in the first iteration of the k-shell decomposition algorithm while periphery of a network are the nodes removed in the last iteration of the k-shell decomposition algorithm.
    c. Both the core and periphery of a network are the nodes which are removed during the last iteration of k-shell decomposition algorithm.
    d. **Core of a network are the nodes removed in the last iteration of the k-shell decomposition algorithm while periphery of a network are the nodes removed in the first iteration of the k-shell decomposition algorithm.**

8. In a clique of size 5
    a. **Every node has a coreness of 4**
    b. Every node has a coreness of 5
    c. Every node has a coreness of 6
    d. Every node has a coreness of 7

    Explanation: In a clique of size 5, every node has degree 4. Hence, all the nodes are removed at 4th iteration.

9. A node that does not belong to the innermost core of the network but has equal spreading power (cascade capacity) as the innermost core is called
    a. Periphery
    b. Special-Core
    c. Hyper-core
    d. **Pseudo-core**
10. Pick the incorrect statement for a complete graph:
    a. Neighborhood overlap is maximum for each pair of nodes
    b. **Structural holes are present**
    c. Edge betweenness of each edge is zero
    d. All nodes score same centrality score for any centrality measure