Surprise Quiz 1

Points: 30/30 Time: 01:33

✓ **Correct** 2/2 Points

1. In a directed network with nodes A, B, and C, where A has an in-degree of 1 and an out-degree of 2, and B has an in-degree of 1 and an out-degree of 1, which of these are wrong about node C?

- [x] C has an in-degree of 1 and an out-degree of 1.
- [x] C has an in-degree of 0 and an out-degree of 2.
- [ ] C has an in-degree of 2 and an out-degree of 1.
- [ ] C has an in-degree of 1 and an out-degree of 0.

✓ **Correct** 1/1 Points

2. Which centrality measure considers the number of direct connections a node has in a network?

- (•) Degree centrality
- ( ) Closeness centrality
- ( ) Betweenness centrality

- ○ Eigenvector centrality

✓ **Correct** 1/1 Points

3. Which centrality measure takes into account the shortest paths that pass through a node in a network?

- ○ Degree centrality
- ○ Eigenvector centrality
- ◉ Closeness centrality
- ○ Betweenness centrality

✓ **Correct** 1/1 Points

4. What centrality measure is based on the concept that a node is important if it is connected to other nodes that are also important?

- ○ Closeness centrality
- ○ Betweenness centrality
- ◉ Eigenvector centrality
- ○ Degree centrality

✓ **Correct** 1/1 Points

5. Which centrality measure is based on the idea that a node is important if it is close to many other nodes in a network?

- ○ Betweenness centrality
- ◉ Closeness centrality
- ○ Degree centrality

Eigenvector centrality

✓ **Correct** 2/2 Points

6. If a researcher has an in-degree of 10 and an out-degree of 8 in a co-authorship network, what cannot be the possible interpretations?

- [ ] The researcher has collaborated with 10 other researchers.
- [ ] The researcher has been a co-author for 8 papers.
- [x] The researcher has not collaborated with anyone.
- [ ] The researcher has both collaborated with 10 researchers and been a co-author for 8 papers.

✓ **Correct** 2/2 Points

7. In a citation network, a node has a high out-degree. What conclusions can be drawn about this node?

- [ ] It is likely an influential research article.
- [x] It is likely a source that cites many other works.
- [ ] It is likely a node with high in-degree.
- [x] It is likely a book or a comprehensive review.

✓ **Correct** 2/2 Points

8. Consider a citation network where a particular node has both high in-degree and high out-degree. What cannot be said about this node?

- [ ] It is likely an influential research article.
- [ ] It is likely a central node that is frequently cited and cites other works.

- [x] It is likely an isolated node with no significant influence.
- [ ] It is likely a book or a comprehensive review.

✓ **Correct** 2/2 Points

9. For an undirected graph with n vertices with no loops, which statements are true regarding the adjacency matrix?

- [x] The adjacency matrix is always symmetric.
- [ ] If two vertices are connected, the corresponding entry in the adjacency matrix is always 1.
- [x] The adjacency matrix is a square matrix of order n.
- [x] The diagonal elements of the adjacency matrix are always zero.

✓ **Correct** 2/2 Points

10. Consider a disconnected graph with two connected components. What can be said about the adjacency matrix of this graph?

- [x] The adjacency matrix will have non-zero entries in the off-diagonal positions corresponding to edges between the components.
- [ ] The adjacency matrix will be singular.
- [ ] The adjacency matrix will have all zero entries.
- [x] The adjacency matrix of each connected component is separate.

✓ **Correct** 2/2 Points

11. In an unweighted directed graph, what is true about the adjacency matrix?

- [x] The sum of the elements in each column represents the in-degree of the corresponding vertex.

- [ ] The adjacency matrix is always invertible.
- [ ] The adjacency matrix is always symmetric.
- [x] If there is an edge from vertex i to vertex j, the (i, j) entry in the adjacency matrix is 1.

✓ **Correct** 2/2 Points

12. If a graph has n vertices and is connected, what can be true about the rank of its adjacency matrix?

- [ ] The rank is greater than n.
- [ ] The rank is always less than n.
- [ ] The rank is always equal to n.
- [x] The rank could be less than n.

✓ **Correct** 1/1 Points

13. In a connected graph, when does the existence of an Euler path imply the existence of an Euler circuit?

- ( ) The graph has all nodes with an odd degree.
- ( ) The graph is acyclic.
- ( ) The graph has no nodes with an odd degree.
- (•) The graph has exactly two nodes with an odd degree.

✓ **Correct** 2/2 Points

14. What are the possible criteria for the existence of an Euler path in an undirected graph?

- [x] All nodes must have an even degree.
- [x] The graph must have exactly two nodes with an odd degree.
- [ ] The graph must be acyclic.
- [x] The graph must be connected.

Read the problem formulation below to answer the following 4 questions

Consider a directed graph with six nodes labeled A, B, C, D, E, and F. The graph has the following directed edges:

- A to B
- B to C
- C to D
- D to E
- E to F
- F to A
- A to C
- C to E

Now, for this graph, answer the following questions:

✓ **Correct** 2/2 Points

15. Identify all nodes that are part of a directed cycle in the graph.

- [x] A
- [x] B
- [x] C
- [x] D
- [x] E
- [x] F

✓ **Correct** 2/2 Points

16. Determine the node(s) with the highest out-degree in the graph.

- [ ] A
- [ ] B
- [x] C
- [ ] D
- [x] E
- [ ] F

✓ **Correct** 2/2 Points

17. Identify the node(s) that are reachable from node B through a directed path.

- [ ] A
- [x] C
- [x] D
- [x] E
- [x] F

✓ **Correct** 1/1 Points

18. Determine the length of the shortest directed path from node A to node E.

4

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