Clicker Quiz BFS – Oct 11

1. Do we always have to perform work on all the nodes in the graph?
   A. Yes
   B. No
2. Do we always have to perform work on all the edges in the graph?

A. Yes
B. No
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3. What is the worst case complexity of the breadth first search algorithm? Assume \( n \) is the number of nodes in the graph and \( m \) is the number of edges.

   A. \( O(\log n) \)
   B. \( O(m \log n) \)
   C. \( O(nm) \)
   D. \( O(n+m) \)
   E. \( O(\log n+m) \)
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4. What is the range of integer values for the “time” variable in the DFS algorithm for a graph \( G = (V, E) \)?

A. 0 to \(|V + E|\)
B. 1 to 2\(|V|\)
C. \(|E|\) to 2\(|V|\)
D. 1 to \(|E| + |V|\)
E. None of the above
5. What is the bound on the work that is done by the DFS algorithm for a graph $G = (V, E)$?

A. $\Theta(\log E)$
B. $\Theta(V)$
C. $\Theta(2V)$
D. $\Theta(V + E)$
E. None of the above
1. Strongly connected components of a graph $G = (V,E)$ can be identified by looking for:

A. Any set of vertices $C \subseteq V$ where every pair of vertices $u,v \in C$, are reachable from each other.

B. The maximal set of vertices $C \subseteq V$ where every pair of vertices $u,v \in C$, are reachable from each other.

C. The maximal set of vertices $C \subseteq V$ where every pair of vertices $u,v \in C$, has an edge between them.

D. Any set of vertices $C \subseteq V$ where every pair of vertices $u,v \in C$, have an edge between them.
2. Given the following graph G, what can we say about strongly connected components of its transpose $G^T$?

A. They are the same as those of G.
B. G and $G^T$ have different strongly-connected components.
C. They may be the same or they may be different; it varies from graph to graph.
Answers

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1. A: Yes, we have to set up the adjacency and the color, $d$, and $\pi$ for each node.
2. B: Yes, we have to set up the adjacency and the color, $d$, and $\pi$ for each node.
3. D: $O(n+m)$

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4. B: $1 – 2|V|$
5. D: dfsVisit is called once for each vertex. During an execution of it, the loop executes once for each vertex in the adjacency list of the vertex, which is once for each outgoing edge of the node. This is bounded by $\Theta(E)$. So the total cost is $\Theta(V + E)$

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1. B: Maximal set, reachable, not necessarily directly
2. A: They are the same