Homework 4 – Answers to Questions

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**Question 1**:

The BFS execution on the given graph results in the following BFS tree:

**Question 2**:

The depth-first search is as follows:  
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19/20 18/21 2/17 4/5



3/16

8/9

12/13

7/10 6/11 14/15

Tree edges are black, back edges are red, forward edges are green, and cross edges are blue.

**Question 3**:

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The depth-first topological order is:

A C F B E K J H I D G

From enumerating the vertices with no predecessors in order whilst removing the necessary edges, we get a possible resulting breadth-first topological order (also keeping alphabetical order in mind):

A C B D F E G H K I J

**Question 4**:

From the previous problem, we use the starting vertices from the order of depth-first topological order:

A C F B E K J H I D G

Following the given algorithm from the sample problem, we then transpose the graph and take the depth-first search from the transpose according to DF topological order above instead of alphabetical order like the problems preceding this one. This DFS must be carried out skipping the discovered/already finished vertices. The DFS starting at A produces an SCC of just A because A immediately finishes. The next undiscovered vertex is C. The DFS at C gives the SCC of C and F which both then finish. We then go to B, it finishes and is by itself. E is by itself and finishes next. K finishes next on it’s own. Then J by itself. Next we get to H which gives the SCC of H I D. Lastly, G is on its own and finishes last.

Just like before, the black edges represent tree edges and red edges are back edges.

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13/14

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