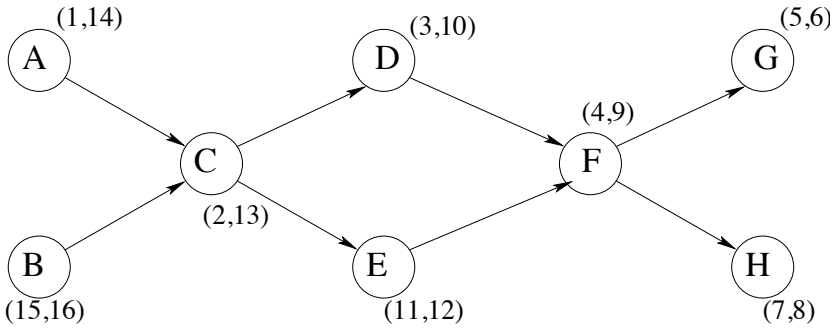
Homework #7 Key

3.3

(a) The figure below shows the `pre` and `post` times in parentheses.



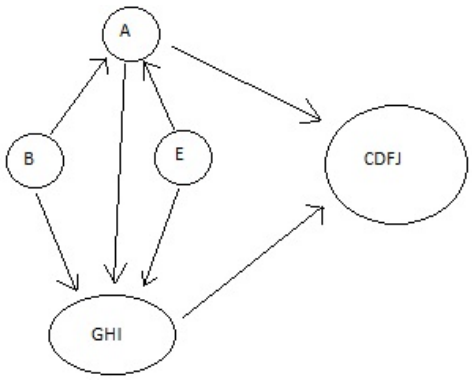
(b) The vertices A, B are sources and G, H are sinks.

(c) Since the algorithm outputs vertices in decreasing order of post numbers, the ordering given is B, A, C, E, D, F, H, G.

(d) Any ordering of the graph must be of the form $\{A, B\}, C, \{D, E\}, F, \{G, H\}$, where $\{A, B\}$ indicates A and B may be in any order within these two places. Hence the total number of orderings is $2^3 = 8$.

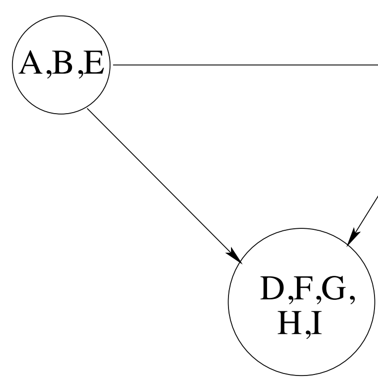
3.4

(i)
(a) Order the algorithm finds the SCCs -1st is $\{CDFJ\}$, 2nd is $\{GHI\}$, 3rd is $\{A\}$, 4th is $\{E\}$, 5th is $\{B\}$.
(b) Sources: $\{E\}$ and $\{B\}$. Sink: $\{CDFJ\}$.
(c) See picture below



(d) Minimum is 2 edges.

(ii) The strongly connected components are found in the order $\{D, F, G, H, I\}, \{C\}, \{A, B, E\}$. $\{A, B, E\}$ is a source SCC, while $\{D, F, G, H, I\}$ is a sink SCC. Adding an edge from any vertex in the sink SCC to any vertex in the source SCC makes the metagraph strongly connected and hence the given graph also becomes strongly connected.


A,B,E
C
D,F,G,
H,I