

Name:

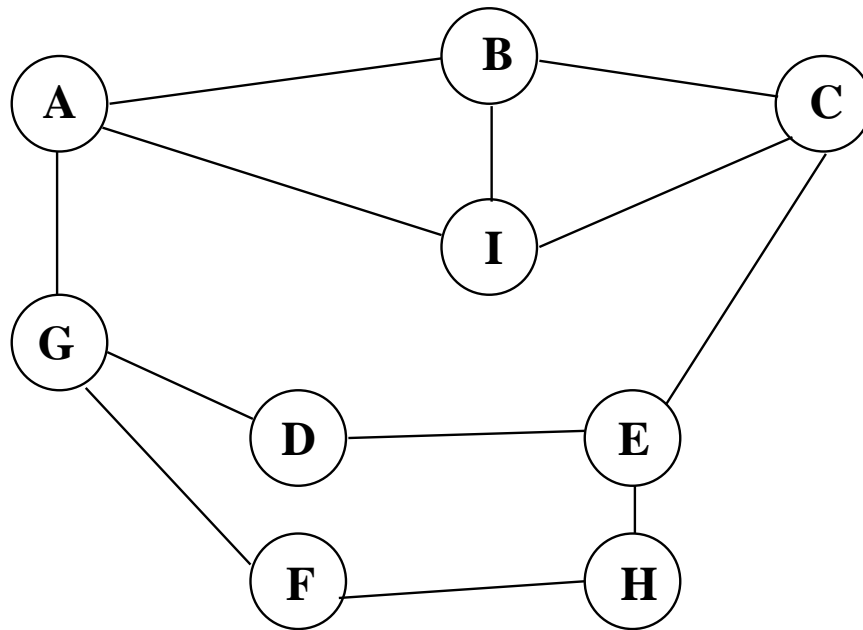
Student Number:

1. **[6 marks:]** Suppose you have a **heap** with 63 nodes implemented as an array with capacity for 128 nodes, each node has an integer key, and the key of each node is larger than the keys of its descendants. How many steps would be required, in the worst case, for each of the following operations (short explanation required):
  - (a) Find the largest key (steps are array accesses)?  
One access, to the zeroeth element.
  - (b) Find the smallest key (steps are array accesses)?  
32 accesses, since the entire bottom row must be checked.
  - (c) Insert a new node (steps are swaps)?  
6 swaps. There are six rows and (in the worst case) the new element must swap with each of them.
2. **[5 marks:]** How many different BSTs can you create with nodes with character keys A, B, C, D? How many of these are AVL trees? Show your work  
  
14 BSTs, of which 4 are AVL (drawings on request).

[Please turn page...]

3. [4 marks:] List the nodes of the following graph in the order they are visited by a Breadth First Search (BFS). Whenever you have a choice of two or more nodes, visit the one with the lowest index.

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



[End of quiz]