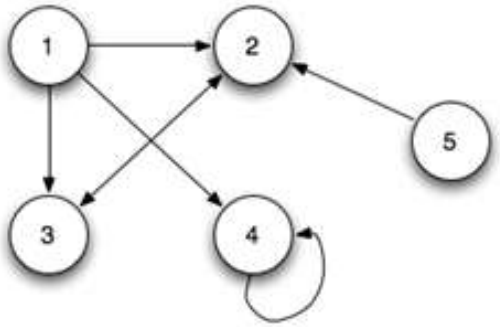
United International University
Department of Computer Science and Engineering

CSI 217:Data Structure Final Exam : Summer 2018

Total Marks: 40 Time: 2 hours

There are FOUR questions. Figures in the right-hand margin indicate full marks.

1. (a) Construct the adjacency matrix for the following graph. [2]



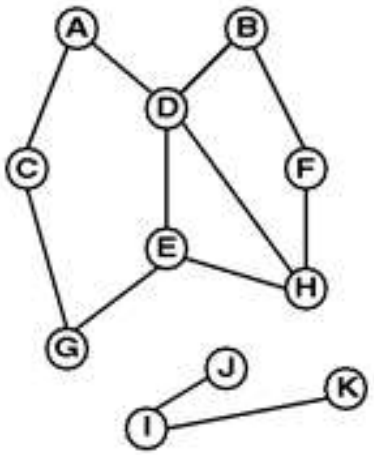
(b) Assume that you are given adjacency matrix representation of a directed graph. Write down a generalized code to identify self-loop from the adjacency matrix representation. [2]

(c) Consider the following pseudo-code for Breadth First Search Algorithms.

```
create a queue Q
put source into Q
visited[source]=1
while Q is non-empty
    u = remove the head of Q
    for v in unvisited neighbours of u
        put v into Q
        visited[v]=1
```

Now some one claims for this pseudo-code, 'All the vertices will enter the queue and removed.' - Do you support this statement? Explain your answer with an example. [2]

(d) Consider the following graph.



This is a disconnected graph. Use or modify the pseudo-code of BFS to find whether a given graph is connected or disconnected. [4]

2. (a) Consider the following structure for a binary tree node.

```
struct SNode{
  int data;
  struct SNode* parent;
  struct SNode* left;
  struct SNode* right;
};
```

Now write down a function int getLeafCount(struct SNode* n) to get the leaf counts of a binary tree. [4]

(b) Somebody is trying to store the directory structure of a file system using a tree. Which type of representation do you suggest for him? Why? [3]

(c) Write a code/pseudo-code that will take a node in the binary tree as input and will find the differences in the total number of nodes in its left and right sub-tree of that node. [5]

3. (a) Given are the postorder and inorder traversal sequences of a binary tree. Construct the tree. [3]

Postorder: {m, i, j, g, k, l, h, f}

Inorder: {i, m, g, j, f, k, h, l}

(b) Construct binary trees for each of the following cases. [3]

i. Same preorder and postorder traversal sequences

ii. Same inorder and preorder traversal sequences

iii. Same inorder and postorder traversal sequences

(c) How many leaves are there in a complete binary tree with 296 nodes? [2]

4. (a) Consider a Min-Priority Queue implemented using an array based implementation of heap. What will be the resulting heap after the following Priority Queue operations. [4]

enqueue(5), enqueue(7), enqueue(9), enqueue(1), enqueue(2), enqueue(15), dequeue(), enqueue(3), dequeue(), enqueue(4).

(b) Write a recursive function to find the maximum element stored in a node in a binary tree. Your function will take the root of that tree as input argument. [3]

(c) 'Breadth first search algorithm can find shortest path in any type of graph' - Do you support this statement? If yes, say why and how. If no, show a counter example and explain why not. [3]