United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Final Exam Year: 2018 Trimester: Spring

Course: CSI 217 Data Structure, Marks: 40, Time: 2 hours

There are **FOUR** sets of questions. Answer **ALL** of them.

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1. a. Write a function that prints the value of the middle node of a doubly linked list. If there is even number of nodes, the code MUST print two values. If there is odd number of nodes, the code MUST print one value.
   Assume that, the node is a structure that looks like as follows. Also assume that, there is data already inserted in the linked list and head is the pointer to the start of the linked list. You just have to write a function called **printMiddleNode()** to do the task. [2.5]

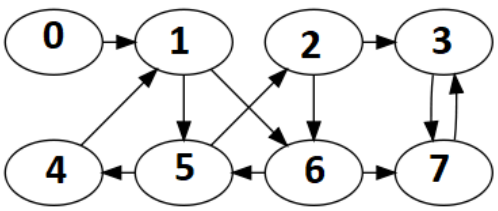
```
struct node{
    struct node *prev;
    int value;
    struct node *next;
};
struct node* head;//points to the start of the doubly linked list
struct node* last;//points to the end of the doubly linked list

void printMiddleNode(){

}
```

   b. Write a code to **delete** an element in the **i) front and ii) end** of a doubly linked list. [2.5]

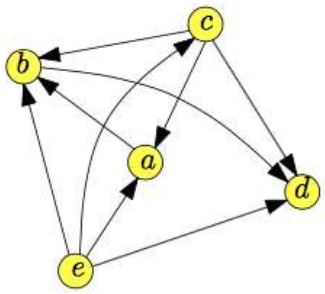
   c. Design a queue(**queue with array**) with two stacks. Your code **MUST** implement the **enqueue(x) and dequeue()** operations using push() and pop() functions of the stack. enqueue(x) means insert x and dequeue means delete operation. [2.5]

   d. Implement the **push() and pop()** operation of a stack (stack with linked list) [2.5]

2. a. Draw the adjacency matrix of the following Graph: [2]



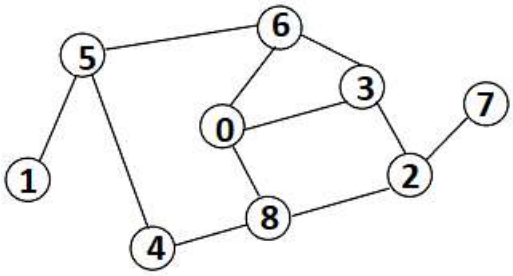
b. Show the mechanism of topological ordering algorithm for the following directed acyclic graph. [4]



c. Construct the distance array for the following Graph, **using BFS**, with **0 as source**. [4]

OR

Show working mechanism of BFS (with **0 as source)** of the following graph.



3. a. Construct a **binary search tree** inserting the following numbers sequentially:

55, 100, 20, 23, 5, 60, 65, 30, 15, 28 [4]

b. Write the preorder, postorder and inorder traversal sequence of your constructed tree in ques. 3(a). [3]

c. Delete node 60, then 65, then 30 (**sequentially**) from your constructed tree in ques 3(a). [3]

4. a. Prove that for n=10 disks, the number of moves required in the Tower of Hanoi problem is $H_{10}= 2^{10}-1$. [4]

OR

Convert the infix expression: (a+b-c*d)/a*(e-f/b*e)-f*g into corresponding postfix expression using stack. And evaluate the postfix expression for the given value: a = 5, b = 7, c = 2, d = 1, e = 5, f = 20, g = 2 and compare the result. [4]

b. Insert the following items in a Hashtable (**size 10**) using **(i) Linear probing and (ii) Chaining** as collision avoiding technique. [3+3=6]

2, 4, 18, 14, 11, 45, 50, 55, 12

Hash function **H** is defined as below:

```
int H (int x){
return  x mod 10 ;
}
```

OR

Construct a binary tree from the given traverse result: [3+3=6]

Preorder : a b d g h e I c f j

Postorder : g h d I e b j f c a

Inorder : g d h b e I a f j c

Also write an algorithm to compute the depth of your constructed tree.