School of Computer Science

CIS*2520: Data Structures
Fall 2024, Lab 3
Week of Sept. 30 to Oct. 04

1 Linked Lists

1. Consider the following function that takes reference to head of a Doubly Linked List as paramete. Assume that a node of doubly linked list has previous pointer as prev and next pointer as next.

```
void fun(struct node **head_ref)
{
         struct node *temp = NULL;
         struct node *current = *head_ref;

         while (current != NULL)
     {
      temp = current->prev;
      current->prev = current->next;
      current->next = temp;
       current = current->prev;
     }

     if(temp != NULL )
              *head_ref = temp->prev;
}
```

Assume that reference of head of following doubly linked list is passed to above function $1 < -- > 2 < -- > 3 < -- > 4 < -- > 5 < -- > 6$. What should be the modified linked list after the function call?

A. $2 < -- > 1 < -- > 4 < -- > 3 < -- > 6 < -- > 5$
B. $5 < -- > 4 < -- > 3 < -- > 2 < -- > 1 < -- > 6$
C. $6 < -- > 5 < -- > 4 < -- > 3 < -- > 2 < -- > 1$

D. $6 < -- > 5 < -- > 4 < -- > 3 < -- > 1 < -- > 2$

2. Consider the linked list $1- > 2- > 3- > 4- > 5- > 6$. What is the output of the following function for a start point to the first node of this linked list?

```
     void fun(struct node* start)
{
          if(start == NULL)
                return;
          printf("%d ", start->data);

          if(start->next != NULL )
                fun(start->next->next);
          printf("%d ", start->data);
}
```

A. 146641

B. 135135

C. 1235

D. 135531

3. Write a program to create a single linked list in which nodes are $1- > 2- > 3- > 4$. Then, insert node 5 in the middle of the linked list after node 3 and return the new linked list.

4. Consider a doubly linked list with 4 nodes. The input of these nodes is as follows:

Input data for node 1: 4
Input data for node 2: 6
Input data for node 3: 8
Input data for node 4 :1
Write a program and implement the following questions on this linked list.

A. Delete a node from the last of this doubly linked list.
B. Find the maximum value from this doubly linked list.

5. We maintain a sorted list of n integers $1, 2, ..., n$. Assume that we need to perform two insertions, one is $x = 0$, and the other is $y = n+1$. We need to maintain the list sorted after the insertion. So the list after inserting x is

$$0, 1, 2, ..., n$$

and the list after inserting y is

$$1, 2, ..., n, n+1$$

Assume that we traverse the list from the first element to the last to find out where we shall insert x and y. Please calculate the total number of operations for inserting x and y if you implement the list as:

A. Singly-linked list
B. Array