Handed out : Fri, Nov 25, 2022

Due : Mon, Nov 28, 2022, 23:59 (NO SCORE for late submissions!)

Submit your file on LMS.
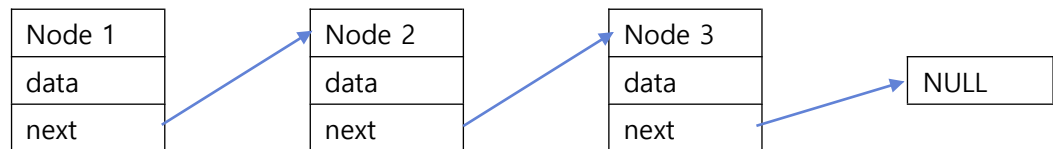
1. Write a program for templated singly linked list.

   A. The list stores the following Node class template instances.

   ```
   template <class T>
   class Node
   {
         public:
                 T data;
                 Node<T>* next;
   }
   ```
   B.

   C. Diagram of singly linked list:

   D. Complete the following class template List that implements singly linked list.

      i. Hint: Set the next of the last node of the liked list to NULL.

   ```
   template <class T>
   class List {
   private:
      Node<T> *head;
   public:
      List() : head(NULL) {};
      ~List();//free resources
      List(T* arr, int n_nodes);//create a list with n_nodes
      void insert_at(int idx, const T& data);
      void remove_at(int idx);
      void pop_back();
      void push_back(const T& val);
      void pop_front();
      void push_front(const T& val);
      friend ostream& operator<<(ostream& out, List& rhs);//print out nodes
   };
   ```
   E.

   F. Use the following main function to test your List class template.

```cpp
int main(){
        int array[5] = {12, 7, 9, 21, 13 };
        List<int> li(array, 5);
        cout<< li << endl; //12,7,9,21,13

        li.pop_back();
        cout<< li << endl; //12,7,9,21

        li.push_back(15);
        cout<< li << endl; //12,7,9,21,15

        li.pop_front();
        cout<< li << endl; //7,9,21,15

        li.push_front(8);
        cout<< li << endl; //8,7,9,21,15

        li.insert_at(4, 19);
        cout<< li << endl; //8,7,9,21,19,15

        li.remove_at(1);
        cout<< li << endl; //8,9,21,19,15

        return 0;
    }
```

G.

H. Input: None

I. Output: Printed results of running main() function

J. Files to submit:

   i. main.cpp – Use the given main() code as is.

   ii. list.h – Implementation of class template List (Write the function bodies in the header file)

   iii. A CMakeLists.txt to generate the executable

```
$ ./list
12,7,9,21,13
12,7,9,21
12,7,9,21,15
7,9,21,15
8,7,9,21,15
8,7,9,21,19,15
8,9,21,19,15
$
```