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File dll.h

dll.h | dll.cpp | main.cpp | DLL.layout

```h
#ifndef DLL_H_INCLUDED
#define DLL_H_INCLUDED

typedef int infotype;
typedef struct elmList *address;
struct elmList{
    infotype info;
    address next;
    address prev;
};
struct list {
    address first;
    address last;
};

void createList_103032400036(list &L);
bool isEmpty_103032400036(list L);
address allocate_103032400036(infotype x);
void printInfo_103032400036(list L);
void insertFirst_103032400036(list &L, address p);
void insertLast_103032400036(list &L, address p);
void deleteFirst_103032400036(list &L, address &p);
void deleteLast_103032400036(list &L, address &p);
void printInfoFrontToBack_103032400036(list L);
void printInfoBackToFront_103032400036(list L);
#endif // DLL_H_INCLUDED

```

File dll.cpp

dll.h | dll.cpp | main.cpp | DLL.layout

```cpp
#include <iostream>
#include "dll.h"

using namespace std;

void createList_103032400036(list &L){
    L.first = nullptr;
    L.last = nullptr;
}

bool isEmpty_103032400036(list L){
    if (L.first == nullptr && L.last == nullptr){
        return true;
    } else {
        return false;
    }
}

address allocate_103032400036(infotype x){
    address p = new elmList;
    p->info = x;
    p->next = nullptr;
    p->prev = nullptr;
    return p;
}

void printInfo_103032400036(list L){
    address p;
    p = L.first;
    if (isEmpty_103032400036(L)) {
        cout << "List Empty";
    } else {
        while (p != nullptr) {
            cout << p->info;
            if (p->next != nullptr)
                cout << ", ";
            p = p->next;
        }
    }

    cout << endl;
}

```

```
44  void insertFirst_103032400036(list &L, address p){
45      if (isEmpty_103032400036(L)){
46          L.first = p;
47          L.last = p;
48      } else {
49          p->prev = nullptr;
50          p->next = L.first;
51          L.first->prev = p;
52          L.first = p;
53      }
54  }
55
56  void insertLast_103032400036(list &L, address p){
57      if (isEmpty_103032400036(L)){
58          L.first = p;
59          L.last = p;
60      } else {
61          p->prev = L.last;
62          L.last->next = p;
63          L.last = p;
64          L.last->next = nullptr;
65      }
66  }
67
68  void deleteFirst_103032400036(list &L, address &p){
69      if (isEmpty_103032400036(L)){
70          p = nullptr;
71      } else if (L.first == L.last) {
72          p = L.first;
73          L.first = nullptr;
74          L.last = nullptr;
75      } else {
76          p = L.first;
77          L.first = L.first->next;
78          L.first->prev = nullptr;
79          p->next = nullptr;
80      }
81  }
```

```
82
83  void deleteLast_103032400036(list &L, address &p){
84      if (isEmpty_103032400036(L)){
85          p = nullptr;
86      } else if (L.first == L.last){
87          p = L.first;
88          L.first = nullptr;
89          L.last = nullptr;
90      } else {
91          p = L.last;
92          L.last = L.last->prev;
93          L.last->next = nullptr;
94          p->prev = nullptr;
95      }
96  }
97
98  void printInfoFrontToBack_103032400036(list L){
99      address p;
100     p = L.first;
101     while (p!= nullptr){
102         cout << p->info;
103         if (p->next != nullptr){
104             cout << ", ";
105         }
106         p = p->next;
107         }
108         cout << endl;
109
110 }
111
112 void printInfoBackToFront_103032400036(list L){
113     address p;
114     p = L.last;
115     while (p != nullptr){
116         cout << p->info;
117         if (p->prev != nullptr){
118             cout << ", ";
119         }
120         p = p->prev;
121     }
122     cout << endl;
123 }
124
```

File main.cpp

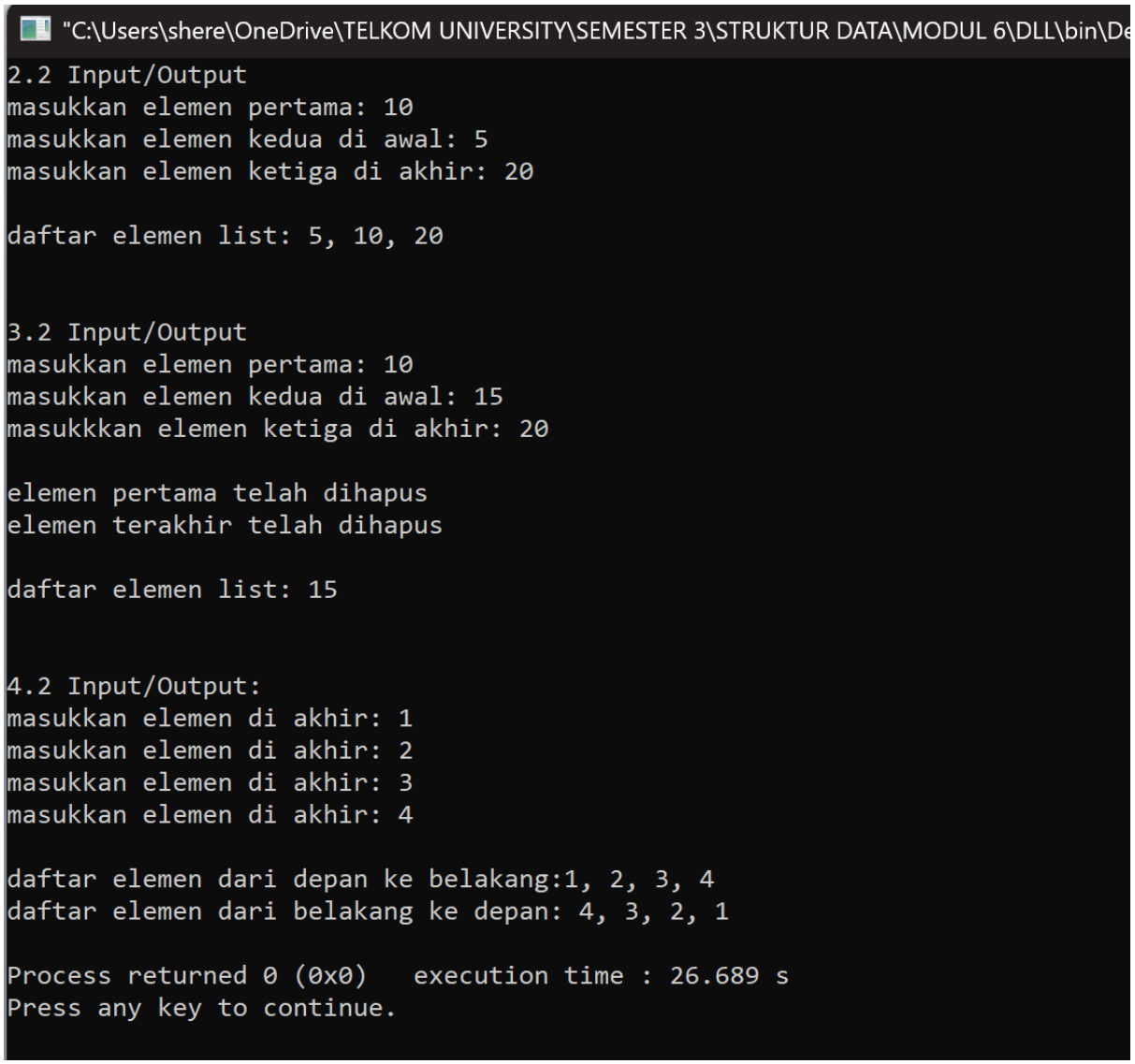
dll.h | dll.cpp | main.cpp | DLL.layout

```cpp
#include <iostream>
#include "dll.h"

using namespace std;

int main(){
    list L;
    address p;
    infotype  x;

    createList_103032400036(L);
    cout << "2.2 Input/Output" << endl;
    cout << "masukkan elemen pertama: ";
    cin >> x;
    p = allocate_103032400036(x);
    insertFirst_103032400036(L, p);

    cout << "masukkan elemen kedua di awal: ";
    cin >> x;
    p = allocate_103032400036(x);
    insertFirst_103032400036(L, p);

    cout << "masukkan elemen ketiga di akhir: ";
    cin >> x;
    p = allocate_103032400036(x);
    insertLast_103032400036(L, p);

    cout << "\ndaftar elemen list: ";
    printInfo_103032400036(L);
    cout << endl;
    cout << endl;

```

```
32
33      createList_103032400036(L);
34      cout << "3.2 Input/Output" << endl;
35      cout << "masukkan elemen pertama: ";
36      cin >> x;
37      p = allocate_103032400036(x);
38      insertFirst_103032400036(L,p);
39      cout << "masukkan elemen kedua di awal: ";
40      cin >> x;
41      p = allocate_103032400036(x);
42      insertLast_103032400036(L,p);
43      cout << "masukkkan elemen ketiga di akhir: ";
44      cin >> x;
45      p = allocate_103032400036(x);
46      insertLast_103032400036(L,p);
47
48      deleteFirst_103032400036(L,p);
49      cout << "\nelemen pertama telah dihapus" << endl;
50
51      deleteLast_103032400036(L,p);
52      cout << "elemen terakhir telah dihapus" << endl;
53
54      cout << "\ndaftar elemen list: ";
55      printInfo_103032400036(L);
56      cout << endl;
57      cout << endl;
58
```

```
58
59      createList_103032400036(L);
60      cout << "4.2 Input/Output:" << endl;
61      cout << "masukkan elemen di akhir: ";
62      cin >> x;
63      p = allocate_103032400036(x);
64      insertLast_103032400036(L,p);
65      cout << "masukkan elemen di akhir: ";
66      cin >> x;
67      p = allocate_103032400036(x);
68      insertLast_103032400036(L,p);
69      cout << "masukkan elemen di akhir: ";
70      cin >> x;
71      p = allocate_103032400036(x);
72      insertLast_103032400036(L,p);
73      cout << "masukkan elemen di akhir: ";
74      cin >> x;
75      p = allocate_103032400036(x);
76      insertLast_103032400036(L,p);
77
78      cout << "\ndaftar elemen dari depan ke belakang:";
79      printInfoFrontToBack_103032400036(L);
80      cout << "daftar elemen dari belakang ke depan: ";
81      printInfoBackToFront_103032400036(L);
82      return 0;
83  }
```

Output


"C:\Users\shere\OneDrive\TELKOM UNIVERSITY\SEMESTER 3\STRUKTUR DATA\MODUL 6\DLL\bin\De
2.2 Input/Output
masukkan elemen pertama: 10
masukkan elemen kedua di awal: 5
masukkan elemen ketiga di akhir: 20
daftar elemen list: 5, 10, 20
3.2 Input/Output
masukkan elemen pertama: 10
masukkan elemen kedua di awal: 15
masukkkan elemen ketiga di akhir: 20
elemen pertama telah dihapus
elemen terakhir telah dihapus
daftar elemen list: 15
4.2 Input/Output:
masukkan elemen di akhir: 1
masukkan elemen di akhir: 2
masukkan elemen di akhir: 3
masukkan elemen di akhir: 4
daftar elemen dari depan ke belakang:1, 2, 3, 4
daftar elemen dari belakang ke depan: 4, 3, 2, 1
Process returned 0 (0x0) execution time : 26.689 s
Press any key to continue.