NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
PROGRAM: SOFTWARE ENGINEERING

DATA STRUCTURES LAB

LAB TASK-12

SUBMITTED BY:

Name: Ahmed Ali

Roll No: 22P-9318

INSTRUCTOR NAME: Sir Saood Sarwar

A DEPARTMENT OF COMPUTER SCIENCE

Q1 CODE:

```
#include<iostream>
using namespace std;

class book
{
	private:
		string isbn;
		string title;
	public:
		book()
		{
			isbn="";
			title="";
		}
		book(string isbn, string title)
		{
			this->isbn=isbn;
			this->title=title;
		}
		friend class hash_table;
		friend int main();
};

class node
{
	public:
```

```
        book data;
        node *next;

    node()
        {
            next=nullptr;
        }
        node(book data)
        {
            this->data=data;
            this->next=nullptr;
        }
};

class hash_table
{
    private:
        node *table;
        int table_size;
    public:
        hash_table(int size)
        {
            table_size=size;
            table=new node[table_size];
            for(int i=0; i<table_size; ++i)
            {
                table[i].next=nullptr;
            }
        }
```

```
        int hash_function(string isbn)
        {
                int hash=0;
                for(int i=0; i<isbn.length(); ++i)
                {
                        hash=(hash*31+isbn[i])%table_size;
                }
                return hash;
        }

        void insert(book copy)
        {
                if(isbn_exists(copy.isbn))
                {
                        cout<<"same isbn book "<<copy.isbn<<" already exists"<<endl;
      return;
                }
   int i=hash_function(copy.isbn);
   node *new_node=new node(copy);
   new_node->next=table[i].next;
   table[i].next=new_node;
}

        void delete_book(string isbn)
        {
                int i=hash_function(isbn);
                node *curr=table[i].next;
                node *prev=&table[i];
```

```
        while(curr)
        {
                if(curr->data.isbn==isbn)
                {
                        prev->next=curr->next;
                        delete curr;
                        cout<<isbn<<" deleted"<<endl;
                        return;
                }
                prev=curr;
                curr=curr->next;
        }
        cout<<isbn<<"not present"<<endl;
}

book *search(string isbn)
{
        int i=hash_function(isbn);
        node *curr=table[i].next;
        while(curr)
        {
                if(curr->data.isbn==isbn)
                {
                        return &curr->data;
                }
                curr=curr->next;
        }
        cout<<isbn<<" not present"<<endl;
```

```
        return nullptr;
}

void display()
{
        for(int i=0; i<table_size; ++i)
        {
                node *curr=table[i].next;
                cout<<"index "<<i<<": ";
                while(curr)
                {
                        cout<<"isbn: "<<curr->data.isbn<<", title: "<<curr->data.title;
                        curr=curr->next;
                }
                cout<<endl;
        }
}

bool isbn_exists(string isbn)
{
        int i=hash_function(isbn);
        node *curr=table[i].next;
        while(curr)
        {
                if(curr->data.isbn==isbn)
                {
                        return true;
                }
                curr=curr->next;
```

```
                }
                return false;
        }
};

int main()
{
        hash_table ht(5);
        int ch;
        string isbn, title;

        do
        {
                cout<<"1. insert"<<endl;
                cout<<"2. search"<<endl;
                cout<<"3. delete"<<endl;
                cout<<"4. display"<< endl;
                cout<<"5. exit"<<endl;
                cout<<"enter choice: ";
                cin>>ch;

                switch(ch)
                {
                        case 1:
                                cout<<"enter isbn: ";
                                cin>>isbn;
                                cout<<"enter title: ";
                                cin>>title;
                                ht.insert(book(isbn, title));
```

```
                    break;

                case 2:
        cout<<"enter isbn: ";
                    cin>>isbn;
                    {
                        book *found=ht.search(isbn);
                        if(found)
                        {
                            cout<<"book founded: isbn: "<<found->isbn<<", title:
"<<found->title<<endl;
                        }
                    }
                    break;

                case 3:
                    cout<<"enter isbn: ";
                    cin>>isbn;
                    ht.delete_book(isbn);
                    break;

                case 4:
                    ht.display();
                    break;

                case 5:
                    cout<<"exiting....."<<endl;
                    break;
```

```
                default:
                        cout<<"incorrect option selected, try again"<<endl;
                        break;
                }
        }
        while(ch!=5);
        return 0;
}
```

Output-01:

```
D:\SUMMER' 24\Data Structures Lab\LAB TASK 12\22
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 1
enter isbn: 12
enter title: qwerty
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 1
enter isbn: 3304
enter title: amei
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 4
index 0:
index 1:
index 2: isbn: 3304, title: amei
index 3:
index 4: isbn: 12, title: qwerty
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 2
enter isbn: 1
1 not present
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 2
enter isbn: 3304
book founded: isbn: 3304, title: amei
```

01

```
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 3
enter isbn: 1
1not present
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 3
enter isbn: 12
12 deleted
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 4
index 0:
index 1:
index 2: isbn: 3304, title: amei
index 3:
index 4:
1. insert
2. search
3. delete
4. display
5. exit
enter choice: 5
exiting.........

--------------------------------
Process exited after 6059 seconds
Press any key to continue . . .
```

02