Lab 11 (Composition, Aggregation)

Task 1:

A university owns various departments (e.g., CS, Electrical Engineering), and each department has a number of professors. If the university closes, the departments will no longer exist, but the professors in those departments will continue to exist. Therefore, a University can be seen as a composition of departments, whereas departments have an aggregation of professors. In addition, a Professor could work in more than one department, but a department could not be part of more than one university.

Write a Class named **Professor** having following attributes:

- name of type string
- employeeID of type int
- designation of type string

Write a Class named **Department** having following attributes:

- name of type string
- deptID of type int
- Array profList of type Professor
- noOfProfessors of type int

Write a Class named **University** having following attributes:

- name of type string
- Array dept of type Department
- numberOfDepartments of type int

Write following functions.

1. Write appropriate getter setter of each data member for each Class.

2. Add/delete/update Department in University class

bool addDepartment(Department D)

bool deleteDepartment(string name)

bool updateDepartment(int id, string name) //Update name of department given

department id.

void Display() function to display university information. Also display department

information in this function.

3. Add/delete/update Professor in Department class

bool addProfessor(Professor p)

bool deleteProfessor (int id)

bool updateProfessor (int id, string newDesignation) //Update designation of the professor given employee id

void Display() function to display department information. Also display professors information in this function.

Create a main class and test the functionalities.

Task 2:

Write a Class named **Time** having following attributes:

- hours of type int
- minutes of type int

Having following member functions:

- `Time();`
- `Time(int, int); //make sure the time is valid`
- `void setTime(int, int); //make sure the time is valid`
- `void getTime();`
- `void printTime();`
- `void incrementHours(); //make sure the time is valid`
- `void incrementMinutes(); //if minutes are 59 and user called this function then hours should be incremented and minutes should be set back to 0`

Write a Class named **Date** having following attributes:

- month of type int
- day of type int
- year of type int

Having following member functions:

- `Date();`
- `Date(int, int, int);  //make sure the date is valid`
- `void setDate(int, int, int);  //make sure the date is valid`
- `void getDate();`
- `void printDate();`

Now write a Class named **Event** having following attributes:

- `string eventName;`
- `Time eventTime;`
- `Date eventDay;`

With following member functions:

```
Event(int hours = 0, int minutes = 0, int m = 1,
            int d = 1, int y = 1900, string name = "Christmas");

void setEventData(int hours, int minutes, int m, int d, int y, string name);
void printEventData();
```

Create a main class and create two objects of the Event class and print the data.

Task 3:

Every **course** has an **instructor**, who will teach the students and a **textbook** which the instructor is going to follow for that course. Your task is to:

Create the **Instructor class** which will have following attributes:

- First name
- Last name
- Office number
- Designation

Note: All of them will be of string data type.

And will have only the following functions:

- A default constructor that assigns empty strings to the instructor's last name, first name,office number and designation.
- A constructor that accepts arguments for the instructor's last name, first name, office number and designation.
- A set function that can be used to set all of the class's attributes.

- A print function that displays the class's attribute values.

Now create the **TextBook** class which will have following attributes:

- string title
- string author
- int book_id

And will have only the following functions:

- a default constructor,
- a constructor that accepts arguments,
- A set function that can be used to set all of the class's attributes.
- A print function that displays the class's attribute values.

Now finally, create the **Course** class which has an Instructor object and a TextBook object as member variables.

Test the functionality of all classes using main by Creating an array of 3 which contains the objects of **course** class and pass the instructor information and textbook information and finally prints the course information.