Question.3 (12 marks)

Consider a company that is in the business of renting DVDs and video tapes. The company has recently entered into e-business and the senior management wants to make the existing system to Web-enabled system. DESIGN and IMPLEMENT a system that manage user login information and allows users to pay rent of DVDs and video tapes online via credit card or debit card. Users may also be allowed to go for an option of "cash on delivery". Add necessary details to this case-study as per your design.

Question.4 (12 marks)

Universities are simultaneously a real estate property management company (residential student housing), restaurant with multiple outlets (dining halls), retailer (bookstore), events management and ticketing agency (athletics and speaker events), police department (campus security), professional fundraiser (alumni development), consumer financial services company (financial aid), investment firm (endowment management), venture capitalist (research and development), job placement firm (career planning), construction company (buildings and facilities maintenance), and medical services provider (health clinic). In addition to these varied functions, higher education institutions are obviously also focused on attracting high caliber students and talented faculty to create a robust educational environment. Your responsibility is to select any 'ONE' of the mentioned systems, add necessary functionalities to your design and APPLY appropriate design to implement the selected system.

Question.5 (12 marks)

"**Prefer composition over inheritance**". GIVE example case study that APPLY concepts to prove this statement. Example case and its design should include complete details of your example.

Restaurants

a) ~~details~~ billing name
b) ~~discovery~~ no. of people

1) Desi → dal chawal
2) Pan Asian → chowmein
3) Italian → pasta, pizza
4) ~~fusion~~ Fast Food → burger, roll, fries
5) Dessert → choc cake, icecream

c) Bill → billing name, selected food items, price

grants

venture capitalist
Startup/Research:
1) Engineering
2) IT
3) Medical

a) Research / startup name
b) description
c) targeted audience
d) How will it help

Question#4:

What are the criteria of selecting any process model(s)? What is the best process model in the following case and Why?

In the first step, your customer wants you to develop a prototype of a large-scale system such as a CRM – Customer Resource Management system. Your customer is keen to participate in the development of his/her system. Your highest priority is to satisfy your customer through early and continuous delivery of valuable software. In addition to this, you and your customer also want to monitor specific activities during the development. You and your customer both will prefer face to face communication during the development phase of the software and working software is your primary objective. **(12 marks)**

Question#5:

WHY do system analysts use Data Flow Diagrams (DFDs) and use case diagrams? DEVELOP a context diagram and level-0 diagram for the hospital pharmacy system described in the following narrative. If you discover that the narrative is incomplete, make-up reasonable explanations to complete the story. Supply these extra explanations along with the diagrams. The pharmacy at Mercy Hospital fills medical prescriptions for all hospital patients and distributes these medications to the nurse stations responsible for the patients' care. Prescriptions are written by doctors and sent to the pharmacy. A pharmacy technician reviews each prescription and sends it to the appropriate pharmacy station. Prescriptions for drugs that must be formulated (made on-site) are sent to the lab station, prescriptions for off-the-shelf drugs are sent to the shelving station, and prescriptions for narcotics are sent to the secure station. At each station, a pharmacist reviews the order, checks the patient's file to determine the appropriateness of the prescription, and fills the order if the dosage is at a safe level and it will not negatively interact with the other medications or allergies indicated in the patient's file. If the pharmacist does not fill the order, the prescribing doctor is contacted to discuss the situation. In this case, the order may ultimately be filled, or the doctor may write another prescription depending on the outcome of the discussion. Once filled, a prescription label is generated listing the patient's name, the drug type and dosage, an expiration date, and any special instructions. The label is placed on the drug container, and the order is sent to the appropriate nurse station. The patient's admission number, the drug type and amount dispensed, and the cost of the prescription are then sent to the Billing department. **(12 marks)**

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR SPRING SEMESTER (BACHELOR OF SCIENCE IN COMPUTER SCIENCE & INFORMATION TECHNOLOGY)
EXAMINATIONS 2018
BATCH 2017

Time: 3 Hours **Dated:27-08-2018**
Max.Marks:60

Object Oriented Programming - CT-251

Attempt all questions
Avoid unnecessary details

Question.1 (12 marks)

a) "Prefer composition over inheritance". Explain with example.
b) What is static member data and static member function? Give example.
c) What are virtual functions and why we need them? Give example.
d) In inheritance relationship, what is the order of construction and destruction?

Question.2 (12 marks)

Classify a **matrix class** with a two-dimensional array as its member data. Include the member functions for addition and multiplication of two matrices. Derive a new class **new_matrix** from the class **matrix** and include the functions for checking compatibility of the matrices for addtion and multiplication.
(If **m1** and **m2** are two matrices, they said to be compatible for addition if the member of rows of m1 is equal to that **m2**. And similarity with regard to columns. They are said to be compatible for multiplication if the number of columns of m1 is equal to the number of rows of **m2**.)

Question.3 (12 marks)

A company name 'ATOM' has a software product 'Electron' which is the time and attendance solution. This company started in 2010, with only 3 employees. The company created software for their internal usage and this software was responsible to keep record of actions any employee can perform in the company base on the role of employee. The roles in the company when company had 3 employees were only software engineers and quality engineers.
The duties of both the roles were as follows,

- Software Engineers (write code for Electron, refactor code for Electron, write unit test for Electron, perform deployment of Electron on client side, planning for the successful completion of task)
- Quality Engineers (perform manual testing of Electron, marketing of electron)

ATOM got investment of 10 million US$ and they hired more people in their engineering team which were 200 and they hired the HR and marketing team as well. The HR team noticed that the duties assigned to the roles were not at all as per their skill set and decided to revise this policy. The duties of the new roles were as follows,

- Deployment Engineers (perform deployment on client side)
- Software Engineers (write code for Electron, refactor code for Electron, write unit test for Electron)

P.T.O

- Quality Engineers (perform manual testing of Electron)
- Automation Engineers (write test automation suits for Electron)
- Performance Engineers (perform performance testing of Electron)
- Security Engineers (find security loop holes in Electron and fix them)
- Assistant Manager Marketing (responsible for marketing and promotions of Electron)
- Assistant Manager HR (responsible for employee policies and recruitment)

Apply best class hierarchy for this scenario. Add necessary details to it.

Question.4 (12 marks)

What is containership and delegation? Consider a simple Shopping Cart where users have options to pay for their purchases in two different ways – using Credit Card or using PayPal. Extend the class diagram by making appropriate connection of PayPal and credit card with Bank account. Add necessary detail to complete this case and apply the implementation of best design pattern(s).

Question.5 (12 marks)

Create a class by name measure with the member data feet and inches. Perform the following:

a) Overload >= operator.
b) Overload == operator.
c) Overload + operator to add two measurements.

SEAT NO. _____

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR SPRING SEMESTER (BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
EXAMINATIONS 2019
BATCH 2018

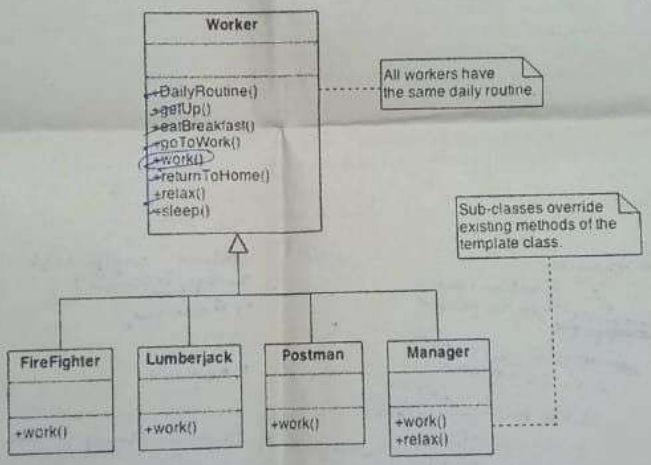
Time: 3 Hours **Dated:24-07-2019**
Max.Marks:60

Object Oriented Programming - CT-251

Attempt all questions
Avoid unnecessary details
Add appropriate details to your solutions (if required)

Question.1 (12 marks)

DESIGN and IMPLEMENT the following class heirarchy and extend user details to complete this scenerio. Also identify which design pattern has been used in this case.



Question.2 (12 marks)

EXPLAIN concepts of "Coupling" and "Cohesion" by providing your own example. Example case should have clear details of design and implementation of these concepts. JUSTIFY using your presented example; **"what refers to good design pattern"**

P.T.O

Ms. Samia Masood Awan SEAT NO. CTAI-22001

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR (BACHELOR OF SCIENCE IN CS & IT SPECIALIZATION IN "ARTIFICAL INTELLIGENCE)

SPRING SEMESTER EXAMINATIONS 2023

Batch 2022

Time : 3 Hours

Dated : 31-JUL-23

Max Marks : 60

Object Oriented Programming - CT-260

1. Review the following codes and identify any errors that might occur. If there are no errors, then write output of the programs. [CLO1, Marks 10]

a)

```
template <typename T>
void test(const T&x) {
  static int count = 0;
  cout << "x = " << x << " count = " << count << endl;
  ++count;
  return;
}
main() {
  test<int> (2);
  test<int>(2);
  test<double>(2.2); }
```

b)

```
class Base{ virtual void display()=0; };
class Child: public Base{
public:
   void display(){
      cout<<"Never Give upIII"<<endl; }
};
int main(){
  Child obj;
  obj.display();
   Base obj2;
   obj2.display(); }
```

c)

```
class A{
public:
        void square (int *x){
              (*x)++;
               *x = (*x) * (*x);  }
        void square (int *x, int *y){
              --(*y);
               *x = (*x) * (*y);  }
};
int main(){
  A obj;
  int number = 10;
  obj.square(&number, &number);
  cout <<number;
}
```

d)

```
class Point {
public:
   int xCoord;  int yCoord;
    Point (int x=0, int y=0){
      xCoord = x; yCoord = y; }
    Point operator+ (const Point& right){
       xCoord+= right.xCoord;
       yCoord+= right.yCoord;
       return Point(xCoord, yCoord);}
};
int main(){
Point p1(5,6), p2(1,1), p3;
p3=p1+p2;
cout<<p1.xCoord<<"\t"<<p1.yCoord<<endl;
cout<<p3.xCoord<<"\t"<<p3.yCoord<<endl; }
```

e)

```
int main() {
  int var = 0;
  try {
        try {
          throw var;  }
        catch (int ex) {
          ex+=10;
          cout << "Error handling :: Val :" << var<<" Ex : "<<ex<<endl;
          throw;  }
      }
}
```

P.T.O

2. Answer the following short questions. [CLO1, Marks 15]
    a. Assume that there is a class D that is inherited from two parent classes B & C, whereas B and C are inherited from class A. Is it possible for Diamond Problem to occur even if none of parent or child classes contain any functions at all and only have variables? Justify your answer using an example.
    b. Differentiate between template functions and overloaded functions. What advantage former has over the later?
    c. With the help of a suitable example, show that how objects of a user-defined class can be written and read from a file.
    d. Explain if destructors can be declared as virtual functions and why?
    e. Assume that a stack had A, C, D, F and K elements already present on it, from bottom to top. Perform the following steps and demonstrate stack and the value of top of stack at each step. POP( ), PUSH(L), PUSH(P), POP( ), POP( ), PUSH(R), PUSH(S), PUSH(M), POP( ), PUSH(D), PUSH(N).

3. Draw UML class Diagram for the scenario given in Question 4. [CLO1, Marks 05]

4. Consider a scenario where you are designing a Course Management system for NED university of Engineering and Technology that offers various courses. Each course has a unique course code, title, and is associated with a department. Additionally, some courses may have prerequisites, while others may have co-requisites. Utilize your knowledge of multiple inheritance to develop the required classes to represent the course hierarchy. [CLO2, Marks 10]
    a. Define a base class called Course with the following characteristics: data members to store the course code and title, constructor to initialize the course code and title, methods GetCode() and GetTitle() to retrieve the course code and title, respectively.
    b. Define a derived class called Department with the following characteristics: inherited from Course, data member to store the department name, constructor to initialize the department name, method GetDepartment() to retrieve the department name.
    c. Define another derived class called Prerequisite with the following characteristics: inherit publicly from Course, a vector data member to store the list of prerequisite course codes, constructor to initialize the prerequisite course codes, method PrintPrerequisites() to print the list of prerequisite course codes by using iterators.
    d. Define a final derived class called CoRequisite with the following characteristics: inherited from both Prerequisite and Department, a vector data member to store the list of co-requisite course codes, constructor to initialize the co-requisite course codes, a method PrintRequisites() to print the list of co-requisite course codes.

5. Create a template matrix class that supports basic matrix operations by considering the following requirements: [CLO2, Marks 10]
    a. Template Matrix Class: that can represent a two-dimensional matrix of any data type, it should have appropriate member variables to store the matrix data and its dimensions, it should a default constructor, parameterized constructor, and destructor.
    b. Overload operators: It should have member functions for overloading * operator for Matrix multiplication. It should also have a method for overloading / operator for performing Scalar division. [Hint: scalar division implies that a matrix divided by a scalar.]
    c. Matrix Operations: It should have member functions for calculating Transpose of a matrix and Determinant calculation only if the size is 2 by 2.
    d. Error handling by defining exceptions: Implement error handling mechanisms to handle exceptional scenarios, such as matrix dimension mismatches or division by zero.

6. Create an abstract class called Tool that should have data member's strength and type. The Tool class should also contain the function void setStrength(), which sets the strength for the Tool. Create 3 more classes called Rock, Paper, and Scissors, which inherit from Tool. Each of these classes will need a constructor which will initialize the strength field. The constructor should also initialize the type field using 'r' for Rock, 'p' for Paper, and's' for Scissors. These classes will also need a function bool fight(Tool) that compares their strengths in the following way:
    - Rock's strength is doubled (temporarily) when fighting scissors, but halved (temporarily) when fighting paper.
    - Paper's strength is doubled (temporarily) when fighting rock, but halved (temporarily) when fighting scissor.
    - Scissor's strength is doubled (temporarily) when fighting paper, but halved (temporarily) when fighting rock.
    - The function returns true if the original class object wins in strength and false otherwise.

    You may also include any extra auxiliary functions and/or fields in any of these classes. [CLO2, Marks 10]

Dr. Saman Hira

SEAT NO. CT-21005

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(BACHELOR OF SCIENCE IN COMPUTER SCIENCE)
SPRING SEMESTER EXAMINATIONS 2022
BATCH 2021

Time: 3 Hours

Dated:11-08-2022
Max.Marks:60

Object Oriented Programming - CT-260

Instructions:

i. Attempt all questions. All questions carry equal marks
ii. Keep your answers concise and to-the-point
iii. State clear assumptions in your answers (if required)

Question#1 **(12 marks)**

Consider a case of **"Super Market"** which sells product under the following categories; grocery, frozen foods, dairy, meat, bakery and pharmacy. You have to design a **"Point-of-sales"*** system that can calculate purchases done by every customer at the counter and generate a receipt. Staff at the counter has to operate this system as follows; All the purchases (product) made by customer will be scanned using bar codes and product will be added to the list of items along with its product_id, product_category, quantity and its price. Total amount must be calculated automatically to generate receipt for the customer. **DESIGN** and **IMPLEMENT** best design for this system by adding appropriate functionalities. "Abstract base class serves as a generic framework of its concrete/derived classes". **JUSTIFY**. **(CLO-3)**

*Point-of-sales system is at every counter of supermarkets where staff scans barcodes of every product to enter price and quantity of the purchased products.

Question#2 **(12 marks)**

In a library management system, a module is required to be developed for a librarian that can have access to the records of students and faculty members. These may include viewing list of defaulters, books issued by students, request to purchase specific books from teachers and monitoring of books ordered from publishers. Add appropriate details to **DESIGN** and **IMPLEMENT** this case. **PRESENT** an example to show the ambiguity in multiple inheritance. **(CLO-2)**

Question#3 **(12 marks)**

Order management consists of several critical business processes, including order, shipment, and invoice processing. These processes spawn important business metrics, such as sales volume and invoice revenue, that are key performance indicators for any organization that sells products or services to others. ABC company manages order management of Watches and Jewelry. The company manages to take orders in their shops and also offer customized products with preferable features; such as colors of straps and chains of watches, and addition/ removal in jewelry designs. This company now aims to shift their store/shop business to online system. This online system will have display of products for these two categories. In addition to that, customer can add products in shopping cart and can make payment using three modes; Credit card, EasyPaisa, Cash on Delivery. **DESIGN** and **IMPLEMENT** best design for this system by adding appropriate functionalities. "Bad design leads to complexities in modification of an application", **JUSTIFY**. **(CLO-3)**

Question#4 **(12 marks)**

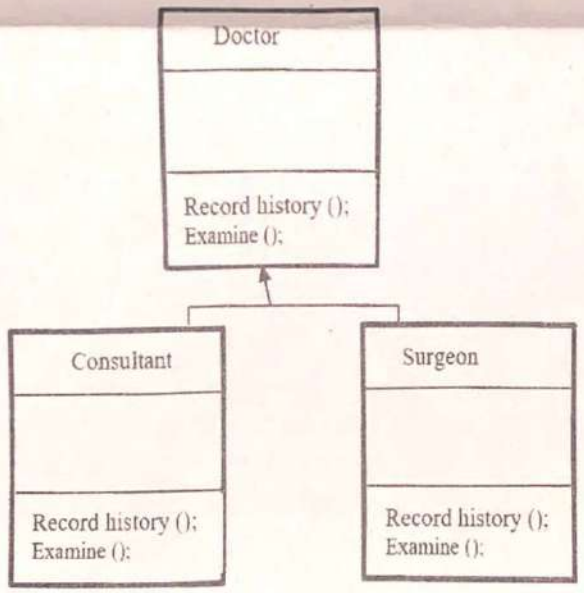
Express your understanding of file handling by **IMPLEMENTING** reading and writing of details of at least 3 students from/to a file. The student's detail must include student roll number, student name and marks. The details must be taken from user and displayed on the screen. "Data Hiding is a strong feature of Object-Oriented Programming that helps in avoiding accidental alterations in the program". **JUSTIFY.** **(CLO-2)**

OR

CREATE a class called Time that has separate int member data for hours, minutes, and seconds. One constructor should initialize this data to 0, and another should initialize it to fixed values. Another member function should display it, in 11:59:59 format. A main() program should create two initialized time objects to perform operator overloading mechanism and store result in the third Time object. **IMPLEMENT** the ability to subtract two time values using the overloaded (-) operator, and to multiply a time value by a number of type float, using the overloaded (*) operator.

Question#5 **(12 marks)**

COMPLETE the design of the given case and **IMPLEMENT** it by adding Object-Oriented Programming concept(s). **(CLO-3)**



* *

SEAT NO. CT-020

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(BACHELOR OF SCIENCE IN COMPUTER SCIENCE & INFORMATION TECHNOLOGY)
SPRING SEMESTER EXAMINATIONS 2021
BATCH 2020

Time: 3 Hours | **Dated:04-09-2021** | **Max.Marks:60**

Object Oriented Programming - CT-251

Instructions:

i. Attempt all questions.
ii. **Attempt all parts of a question together.**
iii. Draw neat and labelled diagrams where required.

QUESTION 1 **(12 marks)**

Consider a case where a movie theatre company only keeps a percentage of the revenue earned from ticket sales. The remainder goes to the movie distributor. Write a program that calculates a theatre's gross and net box office profit for a night. The program should ask for the name of the movie, and how many adult and child tickets were sold. (The price of an adult ticket is $20.00 and a child's ticket is $10 .00.) It should display a report similar to:

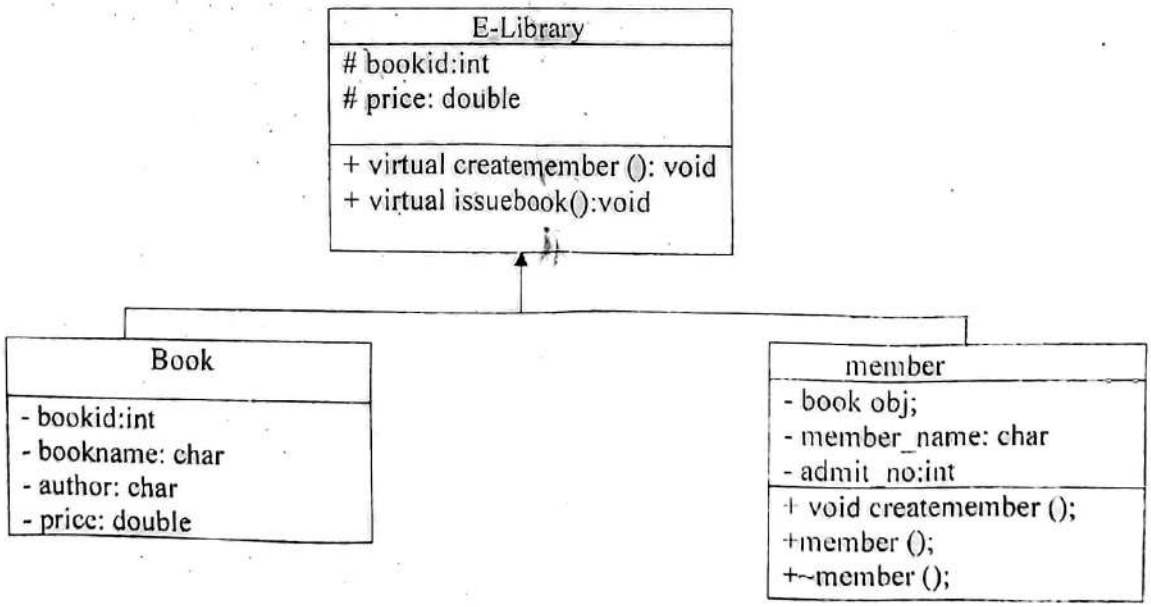
Movie Name:	"Hotel Transylvania"
Adult Tickers Sold:	$ 392
Child Tickets Sold:	$ 128
Gross Box Office Profit:	$ 5,200
Net Box Office Profit:	$ 1,040
Amount Paid co Distributor:	$ 4,160

NOTE: (Assume the theatre keeps 20% of the gross box office profit)

DESIGN and **IMPLEMENT** this case by adding appropriate details as shown in this case.

QUESTION 2 **(12 marks)**

Given design of E-library system is incorrect and incomplete. Use object-oriented concepts to **COMPLETE** this design and **IMPLEMENT** it by adding your own assumptions to this case.



P.T.O

QUESTION 3 **(12 marks)**

The bank's initial goal is to build the capability to better analyze the bank's accounts. **DESIGN** and **IMPLEMENT** a program that manage bank account. Your implementation should include method that ask user to enter the starting balance, the total amount of deposits made, the total amount of withdrawals made, and the monthly interest rate. Based on deposited and withdrawal amounts *(Assume one input for deposits and one input for withdrawals)*, your application should also calculate the current balance in a savings account and display the updated account balance on the user's screen. How can you make use of constructors in this case? Justify if we can use static member function to restrict any information in this case. Use appropriate learned concepts to show your best design. Make your own assumptions to make this case complete and presentable.

QUESTION 4 **(12 marks)**

DESIGN a PayRoll class that has data members as follows; an employee's hourly pay rate, number of hours worked, and total pay for the week. **WRITE** a program with an array of seven PayRoll objects. The program should ask the user for the number of hours each employee has worked, and will then display the amount of gross pay each has earned.

Input validation required: Do not accept values greater than 50 for the number of hours an employee has worked.

QUESTION 5 (Short Answers) **(12 marks)**

a) "Classes within the classes" leads to an important concept in object-oriented programming. **GIVE** a real-life example (only **DESIGN**) to justify this statement.

b) **JUSTIFY** with your example, why experts have suggested to "Prefer composition over inheritance".

c) **WHAT** is the benefit of creating pure virtual functions in the base class?
