*Total No. of Questions: 6*                     *Total No. of Printed Pages:4*

**Enrollment No......................................**

Faculty of Engineering
End Sem Examination Dec 2024
CB3CO04 Object Oriented Programming
Programme: B.Tech.          Branch/Specialisation: CSBS

**Duration: 3 Hrs.**                              **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

|  |  |  | Marks | BL | PO | CO | PSO |
|---|---|---|---|---|---|---|---|
| Q.1 | i. | Which is valid C expression? <br>(a) int cs_num = 100,000; <br>(b) int cs_num = 100000; <br>(c) int cs num = 1000; <br>(d) int $cs_num = 10000; | 1 | 1 | 1,2 | 1 | |
| | ii. | What are the elements present in the array of the following C code? <br>int array[5] = {5}; <br>(a) 5, 5, 5, 5, 5 <br>(b) 5, 0, 0, 0, 0 <br>(c) 5, (garbage), (garbage), (garbage), (garbage) <br>(d) (garbage), (garbage), (garbage), (garbage), 5 | 1 | 1 | 1,2 | 1 | |
| | iii. | Which of the following permits function overloading? <br>(a) type <br>(b) number of arguments <br>(c) type & number of arguments <br>(d) number of objects | 1 | 1 | 1,2 | 2 | |
| | iv. | If different properties and functions of a real world entity is grouped or embedded into a single element, what is it called in OOP language? <br>(a) Inheritance    (b) Polymorphism <br>(c) Encapsulation    (d) Abstraction | 1 | 1 | 1,2 | 2 | |

P.T.O.

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(a) Function of Mammal by the object of Mammal
(b) Function of MarineAnimals by the object of MarineAnimals
(c) Function of BlueWhale by the object of BlueWhale
(d) Function of each of its parent by the object of BlueWhale.

| | | | Marks | BL | PO | CO |
|---|---|---|---|---|---|---|
| | ii. | What is the Diamond problem? How can we get around it? Explain with a suitable program. | 6 | 3 | 1,4 | 4 |
| OR | iii. | What is Operator overloading in C++? Write a C++ program to demonstrate binary operator overloading. | 6 | 3 | 4,5 | 4 |
| Q.6 | | Attempt any two: | | | | |
| | i. | Draw a class diagram for the ATM maps out the structure and attributes of how an ATM works also shows the relationship between multiple classes. | 5 | 6 | 1,4,5 | 5 |
| | ii. | What is Generic Programming? Write a C++ program for class template. | 5 | 3 | 1,4,5 | 5 |
| | iii. | Draw a use case diagram for Library management system having multiple actors: staff and the student, librarian, and library database and various use cases like authenticating, reserve a book, renewing a book, paying a fine, add book, delete book, edit book details, register new user, fill registration form, get Library card etc. Some use cases are related to each other, like invalid renewal and renewing a book, registering a new user, getting a library card ID, etc. | 5 | 6 | 1,4,5 | 5 |

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v. Where does keyword 'friend' should be placed? **1**    2    1,2    3
   (a) function declaration
   (b) function definition
   (c) main function
   (d) block function

vi. What is the difference between constructors and destructors? **1**    4    1,2    3
   (a) They have a different function name
   (b) Constructors does not have return type whereas destructors do have
   (c) Constructors allow function parameters whereas destructors do not
   (d) None of these

vii. What will be the order of execution of base class constructors in the following method of inheritance? **1**    3    1,2    4
   class a : public b, virtual public c {...};
   (a)    b( );    c( );    a( );
   (b)    c( );    b( );    a( );
   (c)    a( );    b( );    c( );
   (d)    b( );    a( );    c( );

viii. A virtual function that has no definition within the base class is called- **1**    1    1,2    4
   (a) Friend Function
   (b) Pure Static Function
   (c) Pure Const Function
   (d) Pure Virtual Function

ix. A template class can have- **1**    1    1,2    5
   (a) Only one generic data type
   (b) At most two data types
   (c) Only generic type of integers and not characters
   (d) More than one generic data type

x. Which stream class is to only write on files? **1**    1    1,2    5
   (a) ifstream
   (b) ofstream
   (c) fstream
   (d) iostream

Q.2 i. Why header files are included in "C Programming"? **2**    2    1,2    1

ii. List the types of operators with example. **3**    1    4,5    1

iii. Explain the decision-making statement in c with example programs. **5**    2    4,5    1

OR iv. What are Library Functions? Explain some string functions with examples. **5**    2    4,5    1

Q.3 i. Write a C++ program to calculate area of different shapes (square, rectangle, triangle) using function overloading. **4**    3    1,4,5    2

ii. Write a C++ program to swap two numbers using "call by value" and "call by reference". **6**    3    1,4,5    2

OR iii. Explain following with real life example of each- **6**    2    1,4,5    2
   (a) Inheritance
   (b) Polymorphism
   (c) Data Abstraction and encapsulation

Q.4 i. What is Constructor? Explain its types and properties. **4**    2    4,5    3

ii. Write a C++ program to display student scorecard along with marks of 5 subjects and percentage using classes and objects. **6**    2    4,5    3

OR iii. What is friend function? Write a C++ program to demonstrate Friend Function. **6**    3    4,5    3

Q.5 i. Create two classes named Mammals and MarineAnimals. Create another class named BlueWhale which inherits both the above classes .Now create a function in each of these classes which prints "I am mammal " ,"I am marine animal " and "I belong to both :mammals and marine animals" respectively . **4**    3    1,4    4
Now, create an object for each of the above classes and try calling:

Q.1 i) Which is valid C expression?                                                  1
b) int cs_num = 100000;

ii) What are the elements present in the array of the following C code?   1
int array[5] = {5};
b) 5, 0, 0, 0, 0

iii) Which of the following permits function overloading ?                     1
c) type & number of arguments

iv) If different properties and functions of a real world entity is grouped or   1
embedded into a single element, what is it called in OOP language?

c) Encapsulation

v) Where does keyword 'friend' should be placed?                                1
a) function declaration

vi) What is the difference between constructors and destructors?               1
(c)Constructors allow function parameters whereas destructors do not.

vii) What will be the order of execution of base class constructors in the   1
following method of inheritance?
class a : public b, virtual public c {...};

b)    c( );    b( );    a( );

viii A virtual function that has no definition within the base class is called   1

d) Pure Virtual Function

ix) A template class can have                                                        1
d) More than one generic data type

x) Which stream class is to only write on files?                                  1
b) ofstream

Q.2 i. **Why header files are included in "C programming".**        2

ii. **List the types of operators with example .**                    3
Arithmetic operator
Logical operator
Relational operator
With example of each

iii. **Explain the decision making statement in c with example**  5
**programs**.
If else
Nested if else
Switch statement

OR iv. **What are Library Functions ?  2 marks**                      5
**Explain some string functions with examples.  3 marks**
strlen ()
strcmp ()
strcpy ()
strncmp ()
strncpy ()
strrev ()
strcat ()
strstr ()
strncat ()

Q.3 i. **Write a C++ program to calculate area of different shapes(square,  4**
**rectangle, triangle) using function overloading.**

**/* C++ program to find Area using Function Overloading  */**

```
#include<iostream>
using namespace std;
int area(int);
int area(int,int);
float area(float);
float area(float,float);
int main()
```

```
{
    int s,l,b;
    float r,bs,ht;
    cout<<"Enter side of a square:";
    cin>>s;
    cout<<"Enter length and breadth of rectangle:";
    cin>>l>>b;
    cout<<"Enter radius of circle:";
    cin>>r;
    cout<<"Enter base and height of triangle:";
    cin>>bs>>ht;
    cout<<"Area of square is"<<area(s);
    cout<<"\nArea of rectangle is "<<area(l,b);
  cout<<"\nArea of circle is "<<area(r);
  cout<<"\nArea of triangle is "<<area(bs,ht);
}
int area(int s)
{
    return(s*s);
}
int area(int l,int b)
{
    return(l*b);
}
float area(float r)
{
    return(3.14*r*r);
}
float area(float bs,float ht)
{
    return((bs*ht)/2);
}
```

ii. **Write a C++ program to swap two numbers using "call by value"   6
and "call by reference".**

**Call by Value in C++ With Example   3 marks**

```
#include <iostream>
```

```
using namespace std;

void swap(int x, int y) {
 int temp = x;
 x = y;
 y = temp;
}

int main() {
 int a = 40;
 int b = 50;
 cout << "Before swap: a = " << a << " b = " << b << endl;
 swap(a, b);
 cout << "After swap: a = " << a << " b = " << b << endl;
 return 0;
}
```

**Call by reference in C++ With Example   3 marks**

```
#include <iostream>
using namespace std;
void swap(int *a, int *b) {
 int temp = *a;
 *a = *b;
 *b = temp;
}
int main() {
 int x = 5;
 int y = 10;
 cout << "Before swap: x = " << x << " , y = " << y << endl;
 swap(&x, &y);
 cout << "After swap: x = " << x << ", y = " << y << endl;
 return 0;
}
```

**Note- Also attempt by single program living 2 function.**

OR    iii. **Explain following with real life example of each :-   2 marks for  6
each**

1. Inheritance

2.Polymorphism

3.Data Abstraction and encapsulation

Q.4　i.　**What is Constructor?　1 mark**　　　　　　　　**4**
　　　**Explain its types　　1 mark**
　　　**and properties.　　　2 marks**
　　ii.　**Write a C++ program to display student scorecard along with　6**
　　　**marks of 5 subjects and percentage using classes and objects.**

```cpp
#include<iostream.h>

#include<conio.h>


class student

{

        int roll_no;

        char name[20];

        char class_st[8];

        int marks[5];

        float percentage;

        float calculate();

        public:

        void readmarks();

        void displaymarks();

};
```

```cpp
float student::calculate()

{

        percentage=0;

        for(int i=0;i<5;i++)

                percentage+=marks[i];

        percentage=(percentage/5);

        return percentage;

}


void student::readmarks()

{

        cout<<"Enter the roll no.:";

        cin>>roll_no;

        cout<<"Enter the name:";

        cin>>name;

        cout<<"Enter the class studing in:";

        cin>>class_st;

        cout<<"Enter the marks:"<<endl;

        for(int j=0;j<5;j++){

                cout<<"\tEnter mark "<<j+1<<":";

                cin>>marks[j];

        }
```

```
}


void student::displaymarks()

{

        cout<<"Roll no:"<<roll_no<<endl;

        cout<<"Name:"<<name<<endl;

        cout<<"Class:"<<class_st<<endl;

        cout<<"Percentage:"<<calculate()<<endl;

}


int main()

{
        student s1;

        s1.readmarks();

        s1.displaymarks();

        return 0;

}
```

OR    iii. **What is friend function?**          **3**   **6**
**marks**
**Write a C++ program to demonstrate Friend Function.**     **3**
**marks**

```
#include <iostream>
```

```
using namespace std;
class Box
{
   private:
      int length;
   public:
      Box(): length(0) { }
      friend int printLength(Box); //friend function
};
int printLength(Box b)
{
   b.length += 10;
   return b.length;
}
int main()
{
   Box b;
   cout<<"Length of box: "<< printLength(b)<<endl;
   return 0;
}
```

Q.5   i.   **Create two classes named Mammals and MarineAnimals .Create**   **4**
**another class named BlueWhale which inherits both the above**
**classes .Now create a function in each of these classes which prints**
**"I am mammal " ,"I am marine animal " and "I belong to both**
**:mammals and marine animals" respectively .**
**Now, create an object for each of the above classes and try calling :**
**1.Function of Mammal by the object of Mammal**
**2. Function of MarineAnimals by the object of MarineAnimals**
**3. Function of BlueWhale by the object of BlueWhale**
**4. Function of each of its parent by the object of BlueWhale.**

```
#include<iostream>
using namespace std;
class Mammals {
public:
    Print() { cout << " I am mammal " << endl;
 }
```

```cpp
};

class MarineAnimals
 {
public:
   Print() { cout << " I am marine animal  " << endl;     }
};

class BlueWhale : public Mammal , public MarineAnimals
{

public:
Print() {
cout << "I belong to both :mammals and marine animals " << endl;
}
};

int main()  {
   Mammal obj1;
Obj1.Print();
MarineAnimals obj2;
Obj2.Print();
BlueWhale obj3;
Obj3.Print();

Obj3.Mammal::Print();
Obj3.MarineAnimals::Print();

Return 0;
}
```

ii. **What is the Diamond problem?   3 marks**                                    **6**
 **How can we get around it? Explain with a suitable program .  3 marks**

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

// Base class
class Base {
```

```cpp
public:
    void fun() { cout << "Base" << endl; }
};

// Parent class 1 with virtual inheritance
class Parent1 : virtual public Base {
public:
};

// Parent class 2 with virtual inheritance
class Parent2 : virtual public Base {
public:
};

// Child class inheriting from both Parent1 and Parent2
class Child : public Parent1, public Parent2 {
};

int main()
{
    Child obj ;
    Obj.fun(); // No ambiguity due to virtual inheritance
    return 0;
}
```

OR     iii. What is Operator overloading in C++ ?   2 marks                              **6**
Write a C++ program to demonstrate binary operator overloading .  4 marks

```cpp
// C++ program to overload the binary operator +
// This program adds two complex numbers

#include <iostream>
using namespace std;

class Complex {
   private:
       float real;
       float img;
```

```cpp
public:
    // constructor to initialize real and img to 0
    Complex() : real(0), img(0) {}
    Complex(float real, float img) : real(real), img(img){}

    // overload the + operator
     Complex operator + (Complex obj1,  Complex  obj2) {
       Complex temp;
        temp.real = obj1.real + obj2.real;
        temp.img = obj1.img + obj2.img;
        return temp;
    }

    void display() {
      if (img < 0)
        cout << "Output Complex number: " << real << img << "i";
     else
        cout << "Output Complex number: " << real << "+" << img << "i";
    }
};

int main() {
    Complex c1(1.0f, 2.0f);
    Complex c2(1.0f, 3.0f);

    // calls the overloaded + operator
    Complex result = c1 + c2;
    result.display();

    return 0;
}
```
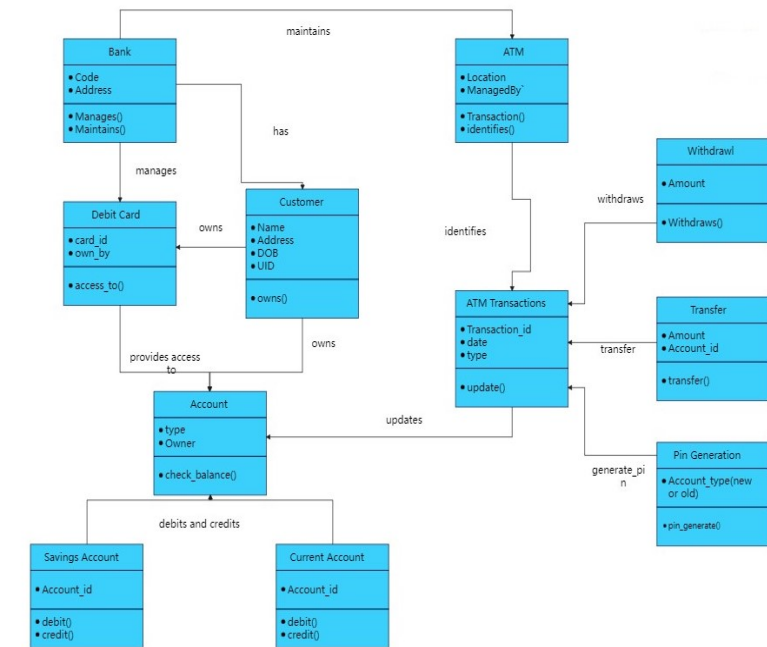
Q.6    Attempt any two:

i.   Draw a class diagram for the ATM   maps out the structure and  **5**
     attributes of how an ATM works also shows the relationship between
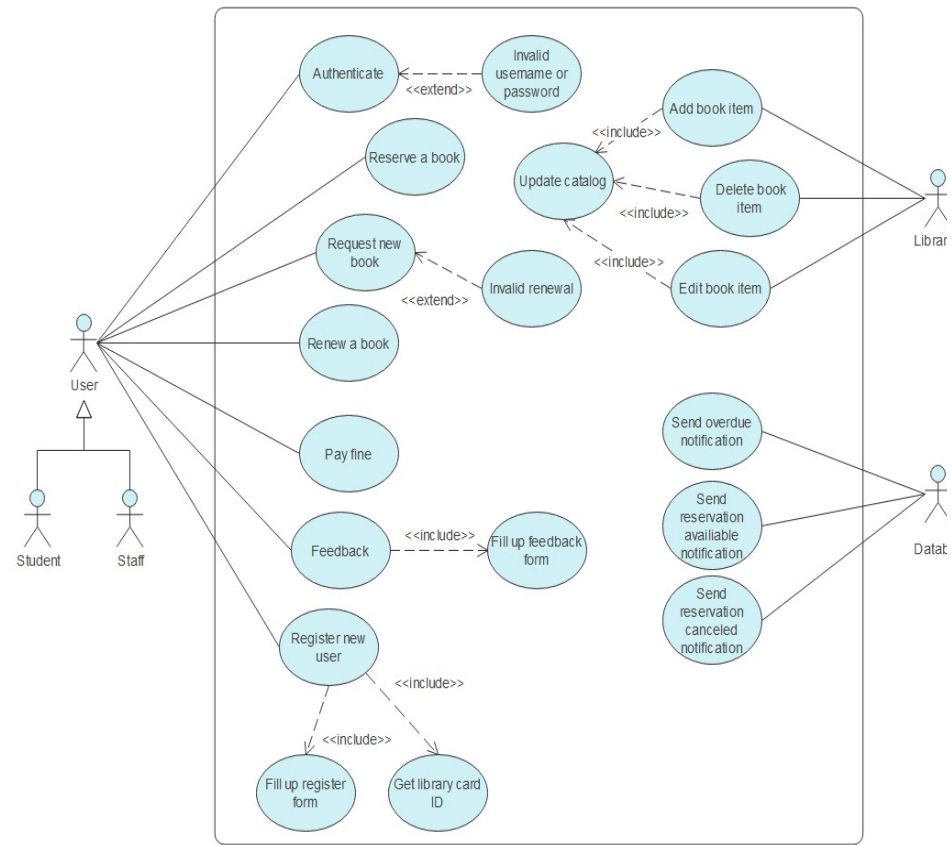     multiple classes.

ii.  **What is Generic Programming ?  2 marks                              5**
     **Write a C++ program for class template .   3 marks**

iii. Draw a use case diagram for Library management system having  **5**
     multiple actors: staff and the student, librarian, and library database and
     various use cases like authenticating, reserve a book, renewing a book,
     paying a fine, add book, delete book, edit book details, register new
     user, fill registration form, get Library card etc. Some use cases are
     related to each other, like invalid renewal and renewing a book,
     registering a new user, getting a library card ID, etc.

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