VIT
Vellore Institute of Technology

Final Assessment Test (FAT) – June 2022

Programme	B.Tech	Semester	Winter Semester 2021-22
Course Title	STRUCTURED AND OBJECT-ORIENTED PROGRAMMING	Course Code	BCSE102L
Faculty Name	Prof. Sindhia Lingaswamy	Slot	D2
		Class Nbr	CH2021222300383
Time	3 Hours	Max. Marks	100

Part-A (4 X 5 Marks)
Answer All questions

1. Predict output of the following code. Justify your answer. [5]

```
#include<stdio.h>
int fun()
{
 static int num = 40;
 return num--;
}

int main()
{
 for(int i=1; fun(); i++)
    printf("%d ", fun());
 return 0;
}
```

→ value does not change throughout the program.
→ decrement.

2. Predict output of the following program. Justify your answer. Assume x is stored at memory location 2000. [5]

```
#include <stdio.h>
 int main()
{
 int x;
 int *ptr=&x;
  *ptr = 0;
 printf(" x = %d *ptr = %d \n", x, *ptr);
 *ptr += 5;
 printf(" x = %d *ptr = %d \n", x,*ptr);
  (*ptr)++;
 printf(" x = %d *ptr = %d\n", x, *ptr);
  ptr++;
  printf(" ptr = %p *ptr = %d \n", ptr, *ptr);
  return 0;
}
```

→ address = 2000
→ (0)
0, 0
(+5)
5 5
6 6

3. Modify the following code to resolve the ambiguity so that the class TA will have only one copy of x. Also predict output of the modified code. [5]

```
#include<iostream>
using namespace std;
class Person {
public:
Person(int x) { cout << 2 * x << " "; }
Person() { cout << 3 << " "; }
};
class Faculty : public Person {
public:
Faculty(int x) :Person(x) { cout << 3 * x << " ";}
};
class Student : public Person {
public:
Student(int x) :Person(x) {cout << 3 * x << " ";}
};
class TA : public Faculty, public Student {
public:
TA(int x) : Student(x), Faculty(x) {cout << 5 * x << " ";}
};
int main()
{
TA ta1(30);
}
```

4. Consider the following fragment of the code. Understand the main function and complete the class definition with appropritate constructor and operator overloading functions. [5]

```
#include<iostream>
using namespace std;
class ComplexNum {
  int r, i;
  public:
  void show(){cout<<r<<" "<<i<<endl;}
};

int main()
{
  ComplexNum c1(1,4);
  ++c1;
  c1.show();
  c1++;
  c1.show();
  return 0;
}
```

Part-B (8 X 10 Marks)

Answer All questions

5. Suppose you are asked to design an application for Electricity bill generation for the state government. The electricity bills are calculated per user with the total number of units consumed. The customers are provided with a subsidy for the first 100 units free of charge from the total number of units consumed. The following table provides the slab and tariff details for calculating the bill. [10]

Units consumed	Calculation	Price per unit
0-100	-	Rs.0/.
0-200	For first 100 units free and for the remaining 100 units amount will be calculated	Rs.1.5/.
0-300	For first 100 units free and for the remaining 200 units amount will be calculated	Rs.2.5/.
300-500	For the first 100 units free and for the remaining 400 units the charges will be calculated	Rs.4.5/.
>500	The user has to pay charges for all the incurred units of electricity.	Rs.6.0/.

Given the number of units consumed by a customer, write a C program to generate the EB bill using the above tariff table.

6. A University maintains a course registration system that has data about the list of courses enrolled by each student. Each course has an unique integer ID. Write a 'C' program to read the courses enrolled by a student and the corresponding credits as a 2-dimensional array and pass this array as an argument to a function that returns the total credits registered by each student. A minimum of 18 credits is to be registered for each semester. The function must display a message if the total credits registered is less than the minimum credits. Assume that all the courses have 3 or 4 credits. Write at least one valid test case and give appropriate comments in the program. [10]

7. Consider the Employee payroll system of an organization where information about employees such as salary and years of experience (YoE) are stored in 2 different 1-dimensional arrays. The system admin of the payroll system has entered salary in the place of years of experience and vice-versa. Write a C program to swap the elements in the salary and YoE arrays using call by reference. The program must use dynamic memory allocation to store the details (salary and YoE) of 'N' employees. [10]

8. Assume that you have received a gift voucher of 'x' rupees for a textile shop. You are allowed to purchase any number of clothes for the entire amount but maximum 2 in each item. Write a C program to plan your purchase. Define a structure to represent the item (item_code and price). Pass the array of structures as a argument to a function for calculating the netamount (quantity * price) and printing the balance after every purchase. The user can choose to keep some balance or purchase until the gift voucher is exhausted. [10]

e.g

x = 1000

item1 <101, 250>, quantity=2

Balance = 500

item2 <102, 150>, quantity=1

Balance = 350

9. Suppose you are asked to design a phonebook that has N entries. Each entry is modelled as a class having attributes such as entry_id, name and a 10 digit phone_number. Here entry_id uniquely identifies each phonebook entry and it is auto-generated with static initialization. Note that the details such as entry_id, name and phone number are private data members of the class. . Write a C++ program that includes a class for the phonebook as described above and a friend function to diplay the matching phone number and entry_id for a given name. [10]

10. Assume XYZ conducts a technical competition to the college students. The students belong to either Electronics background or Computer Science background. Define a base class student which stores information such as student id, name and marks of three levels of competition. From the base class, derive two classes, one for students belonging to Electronics stream and other class for the students belonging to Computer Science stream. Include necessary member functions in order to achieve the following tasks: [10]

i. Get values from the user and display the same.

ii. Calculate the total marks of three levels of competition.

iii. Display the average mark scored by each student from electronics and computer science stream.

Write a C++ program using appropriate inheritance to implement the same. (Note-Write at least one valid test case and give appropriate comments in the program)

11. Consider an online ticket booking system of a movie hall. Assume that you are going to book ticket for only one person. Ticket price is caculated based on the type of seat : NORMAL (220 Rs.) and EXECUTIVE (340 Rs.). Along with ticket type, you may also order for refreshments which are available as combo packages with price of 100Rs, 200Rs, etc. [10]

Given seat type and refreshments package price, you need to calculate the net price to be paid.

There is a special kind of ticket VIP_ticket, booked by VIP customers who will get some discount on seat price as well as refreshment price. The discount depends on the VIP quota level as described below.

- for quota level 1 to 3, 3% discount on seat price and 2% on refreshment price
- for quota level 4 and above, 5% discount on seat price and 4% on refreshment price

Write a C++ program which includes base class ticket and derived class VIP_ticket as described above and calculates the ticket price depending on the customer using dynamic polymorphism.

12. Create the C++ Function Template named *Series* which has three parameters sum, x, and n. The first two parameters will have the type represented by the function template type parameter T. The third parameter will always be int. The return type is void. All parameters are passed by value except for sum which is passed by reference. A Template Function created from *Series* will compute sum = 1 + x + 2x + 3x + ... + nx for both int and float values of x. [10]