VIT
Vellore Institute of Technology

Course: BCSE102L - Structured and Object-Oriented Programming

Final Assessment Test – June 2023

Class NBR(s): 5535/5539/5541/5544/5548/5569/5574/ 5577/5581/5584/5589/6302/6392 Slot: D2

Time: Three Hours Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN "OFF" POSITION IS TREATED AS EXAM MALPRACTICE

General Instruction:

(i) While answering programming questions, students are instructed to include main method.
(ii) Theory questions where ever applicable mention syntax with relevant example
(iii) Do not abbreviate code, such as writing ditto marks ("") or dot-dot-dot marks (...).
(iv) Write the program Objective, Algorithm and code for all programs

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Explain the two way selection in C programming with syntax. [4]

   b) Explain the difference between Sentinel and Counter Controlled Loop in C programming. [3]

   c) List the hierarchy of data types in C programming. Comment on the data loss based on the hierarchy, during conversion from lower to higher data type and from higher to lower data type. [3]

2. Given an array of integers, return a new array such that each element at index i of the new array is the product of all the numbers in the original array except index the i. For example, if input is [1, 2, 3, 4, 5], the expected output would be [120, 60, 40, 30, 24]. If our input was [3, 2, 1], the expected output would be [2, 3, 6]. Write a C program to solve the above.

3. a) Explain different storage classes in a C program with examples. [3]

   b) The employer wishes to appreciate the employees based on their performance as EP. Each employee's performance is graded based on their Product Selling score(PS) and customer feedback score(CF). Following are the conditions: [7]

   i) If product selling (PS) score is above 50/100 then the employee can be considered for EP.

   $$PS + CF > 50$$

   ii) Incentive calculation:

   Incentive = (% of EP) + 50% of salary.

Determine how many employees are eligible for EP and what is the total incentive to be supported in Rupees.

4. a) Explain function pointers in C. Illustrate how to sort an array in ascending order using function pointers in C programming. [5]

b) Identify the problem with the code given below and explain its effect [5]

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
int *p = malloc(sizeof(int));
*p = 42;
p = malloc(sizeof(int));
printf("%d",*p);
free(p);
}
```

5. An Astrophysicist is involved in rocket modelling and he is in need of finding the height of the rocket when a rocket fired into the air using quadratic equation. Suggest a suitable structure construct in C. All variables according to the datatype needs to be used under the structure.

Sample Test Case

Enter coefficients (a, b, and c): 1 -5 -6
The quadratic equation: 1x2-5x-6
The discriminant: 49.000000
Roots are 6.000000 and -1.000000

6. a) Compare and contrast the constructor and destructor in C++. What is the difference between the following two statements? Note that T1 and T2 are objects of time class. [5]

time T2(T1);
time T2 = T1;

b) With an example show the use of this pointer to return the reference of calling object. [5]

7. Develop a C++ program to print the Floyd's Triangle in object-oriented programming (OOP) using the Multiple inheritances.

Sample Input:
Enter no of rows: 4
Sample Output

1
22
333
4444

8. Create a Point class representing x and y coordinates with a default constructor to construct a temporary object ad parametrized constructor for passing the coordinate values.
   a) Provide a member function to show the coordinates.
   b) Overload the binary operator + using friend function and perform the addition of two points.
   c) Provide the function definition for the overloaded + member operator of the Point class.
   d) Provide overload assignment for Point and return the object that generated the call using this pointer.
   e) Test the class created by instantiating and object with points (10,20) and (5,30) Perform overloading and show the result as (15,50)
   f) Briefly explain the ways of Binary operator overloading used in implementing the above C++ program.

9. a) Compare and contrast between virtual functions and pure virtual function. [5]

   b) Govt of India wishes to give scholarship for students who are falling under specific category" [5]

   Category 1: if Grade >= B and Age >= 22
   Scholarship = 10,000.
   Category 2: if Grade <= B and Age > 20
   Scholarship = 8,000.
   Category 3: if Grade < C, Age < = 20
   Scholarship = 6,000.

   Implement a C++ code, using functional overloading and explain.

10. a) Create the C++ Function Template named multiples so that it has three parameters sum, x, and n. The first two parameters will have the type represented by the function template type parameter. n 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 multiples will compute... [5]

    $sum = 1 + x + 2x + 3x + ... + nx$

    b) List the Standard Template Library components in C++ and briefly explain a sequential container with example. [5]

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