Object Oriented Programming & Design - Monsoon 2023

Midterm Practice Questions

Student's Details

Name of the Student:

Roll Number:

Stream:

Question Structure and Instructions

This paper consists of two sections:

1. The 1st section consists of 10 short conceptual questions each carrying 3 points.

2. The 2nd section consists of 2 longer questions each carrying 5 points.

1 Short Conceptual Questions (3x10=30 points)

There are 10 questions in this section each worth 3 points. You may write the answers to these questions succinctly.

A1 Assume that an array *arr* has a starting address of 1000. What will be the output of the following line? You may explicitly write any reasonable assumption.

```
int arr[10];
cout << arr + 5;
```

A2 Consider two sorting algorithms having time complexity (both average and worst case) of $O(n^2)$ and $O(n \log n)$. Suppose you are asked to sort an array of 10 elements. Which of them is likely to be faster and why?

A3 Consider a program which uses a function that is called 10000 times. What will be the advantage and disadvantage of making it inline?

A4 Consider a situation where you have a multiple gates adjacent to each road at IIIT-Delhi. What type of relationship is this, in the context of object-oriented design?

A5 Suppose you have the following code fragment:

```
class Base {
    public:
    void fun() { cout << "Base Function"; }
};
class Derived: public Base {
    public:
    void fun() { cout << "Derived Function"; }
};
int main(void) {
    Base *b = NULL;
    b = new Derived;
    b->fun();
    return 0;
}
```

What will be the output of the above code?

A6 Consider modeling our grade ERP system using classes and objects. A BTP or an MTech thesis is only complete if a student takes it for at least two semesters. For MTech thesis, grades are only assigned after the entire thesis is completed. All other courses are completed every semester. How would you model the *gradeAssigned()* function? Show using a code fragment.

A7 What will be the output of the following code?

```
class Base {
        public:
         Base() { cout << "Base Function Constructor"; }
         ~Base() { cout << "Base Function Destructor"; }
};
class Derived: public Base {
        public:
         Derived() { cout << "Derived Function Constructor"; }
         ~Derived() { cout << "Derived Function Destructor"; }
};
int main(void) {
        Derived *d = NULL;
        d = new Derived;
        delete d;
        return 0;
}
```

A8 What will be the output of the following code?

```
class Base {
        public:
        int a;
        void fun(int a) {
            a += 5;
            cout << a << endl;
        }
};
int main(void) {
    Base b;
    b.fun(5);
    cout << b.a << endl;
    return 0;
}
```

A9 Suppose a programmer wants to identify which part of the code consumes the maximum amount of time. What is the easiest profiler to use for this purpose?

A10 Suppose you define a global variable x in a file *p1.c*. How do you utilize it in another file *p2.c*?

2 Long Questions (5 x 2 = 10 points)

There are 2 questions in this section each worth 5 points.

B1 Design the class structure, of a university employees roster, where there are both teaching and non-teaching staff. The teaching staff has a hierarchy, where there are various department heads as well as deans. There is a separate hierarchy too, of positions such as full professors, associate professors and assistant professors. Design a class structure to model this situation.

B2 Consider the following program, and then the given execution commands. Arrange the commands in increasing order of their execution times.

```
int main(void) {
    int n = 10000, arr[10000];
    for (int i = 0; i < n; i++) {
        arr[i] = arr[i] * 2;
    }
    return 0;
}

gcc -O2 prog.cpp && ./a.out
gcc prog.cpp && ./a.out
gcc -g prog.cpp && valgrind ./a.out
```