INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE

SCHOOL OF MATHEMATICAL & COMPUTATIONAL SCIENCES

PG - I (SMCS), Autumn Semester 2022-23

Instructor: **Debarshi Kumar Sanyal** Assignment Number: **3**

Course: **COM 4111: Object-Oriented Programming with C++** Date: **Sep 14, 2022**

INSTRUCTIONS

(1) Create a folder with the name `Assignment_3_$name$` (where `$name$` denotes name of the student). In that folder create sub-folders for each problem (example: `prob_0, prob_1, prob_2`, etc.). Write your codes for a particular problem in the respective folder (e.g., `prob1` might contain two C++ files `swap.cpp` and `swap2.cpp`)

(2) Give meaningful comments to explain the method used in your program. Programs without valid comments will be evaluated to zero marks.

Problem 1 Declare a structure `Course` to model a PG course. It must have a name (type: `const char*`), the semester in which it is offered (type: `unsigned short` or `enum`), and an upper limit on the number of students who can credit the course (`unsigned int`). Each course also has a unique course id (type: `unsigned int`). The smallest course id is 100 and each new course gets an id equal to one plus the then largest existing course id. Write separate functions to (1) check if two courses are offered in the same semester, (2) check if two courses are identical (except, possibly, for course id), (3) update the details of a course, and (4) print the details of a course. Decide judiciously whether the parameters should be passed by value or by reference to these functions. Also write a suitable `main()` function to demonstrate a few uses of the above functions. [`course.cpp`]

Problem 2 Write a C++ program to calculate the value of the expression $S = 1 + 2^2 + \ldots + N^2$ where N is an user input. Use an `inline` function to compute x^2 where x is an input integer. [`seriesSum.cpp`]

Problem 3 Find the errors, if any, in the following program snippets. Justify your answer.

1.
```
enum class TL { red, green, blue };
enum TS { red, yellow, green };

void f() {
  TL x = TL::green;
  TS y = TS::green;
  int ix;
  int iy;

  x = TL::red;
  x = red;
  x = 1
  x = y;
  ix = TL::red;

  y = TS::red;
  y = red;
  y = 1;
  y = x;
  iy = red;
}
```

2.
```
void f(int i) {
 int x = i*2;
 switch (i) {
  case 3: cout<<"Three"<<endl;
          break;
  case 3.2: cout<<"Slightly exceeds three"<<endl;
            break;
  case 6-4: cout<<"Less than three"<<endl;
            break;
  case 6-3: cout<<"Again three"<<endl;
            break;
  case x: cout<<"What's this?"<<endl;
          break;
 }
}
int main() {
  f(3);
  return 0;
```

```
}
```

3.
```
int x1 = 7;
int square(int x) { return x*x;}
constexpr int x2 = 7;
constexpr int x3 = x1;
constexpr int x4 = x2;

void f() {
  constexpr int y1 = x1;
  constexpr int y2 = x2;
  constexpr int y3 = square(x1);
  constexpr int y4 = square(x2);
}
```

4.
```
void f(const float& a) {}
void g(float& b) {}
void h(double d, float r, int i) {
  f(2.0f);
  f(r);
  f(2*r);
  f(d);
  f(i);

  g(2.0f);
  g(r);
  g(2*r);
  g(d);
  g(i);
}
int main() {
  double x = 5.5;
  float y = 6.3f;
  int z = 21;
  h(x, y, z);
  return 0;
}
```

Problem 4 State with justification the output of each of the following program snippets. Include suitable header files.

1.
```
void f(int n) {
  while (n--) {
    static int flag = 0;
    int x = 0;
```

```
    cout << "f(): n = " << n << ", flag = " << flag++ << ", x = " << x++ << endl;
  }
 }
 int main() {
   f(2);
   f(3);
   return 0;
 }
```

2.
```
void f(int val, int& ref){
  val = val * 2;
  ref = ref - 5;
  val = ref + 20;
  cout<<"f(): val = " << val << ", ref = " << ref <<endl;
}
int main() {
 int i = 10;
 int j = 10;
 f(i,j);
 cout<<"main(): i = " << i << ", j = " << j <<endl;
 f(i,i);
 cout<<"main(): i = " << i << ", j = " << j <<endl;
 return 0;
}
```