Tutorial 1 – C/C++ Primer

I - Required

**Question 1**: What is the output of the following code? Explain your answer.

```cpp
char str[5] = "ABC";
cout << str[3];
cout << str;
```

- (a) A
- (b) AB
- (c) ABC
- (d) Compile time error

**Question 2**: What is the output of the following code? Explain your answer.

```cpp
int a = 5, b = 10, c = 15;
int *arr[3] = {&a, &b, &c};
cout << *arr[*arr[1] - 9];
```

- (a) 5
- (b) 10
- (c) Garbage value
- (d) Compile time error

**Question 3**: What is the difference between struct and class in C++?

**Question 4**:  
- (a) Declare a dynamic array of pointers (to integers) of size 10?  
- (b) What happens when `delete` is use with a NULL pointer? What if we call `delete` twice on the same pointer?

**Question 5**: Consider the following recursive function `fun(x, y)`. What is the value of `fun(3, 2)`? List the recursive function calls.

```cpp
int fun(int x, int y) {
    if (x == 0)
        return y;
    return fun(x - 1, x + y);
}
```
II – Advanced (required for honor classes)

**Question 1:** "For" loops can always be re-written as "while" loops, and vice-versa. Are the following two codes equivalent, and what is their output? Explain your answer, and run the codes to check.

(a)
```cpp
int count = 1;
for (; count <= 5 ; count++)
{
    int count = 1;
    cout << count << "\n";
}
return 0;
```

(b)
```cpp
int count = 1;
while (count <= 5)
{
    int count = 1;
    cout << count << "\n";
    count++;
}
return 0;
```

**Question 2:** Given `int x = 0` and the following functions:

```cpp
void f(int x) {
    x++;
    return;
}
void g(int &x) {
    x++;
    return;
}
void h(const int &x) {
    x++;
    return;
}
```

What is the value of `x` after each function call `f(x)`, `g(x)` and `h(x)`?
Question 3: What is the output of the following program? Correct the program if there is any compile time error.

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

class Test {
    int x;
    Test() { x = 5; }
};

int main() {
    Test *t = new Test;
    cout << t->x;
}
```

Question 4: What is the value of q[2] and p[1][2] after each call to `delete`?

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

int main() {
    int **p = new int*[5];
    int *q = new int[5];
    for (int i = 0; i < 5; i++) {
        q[i] = i;
    }
    p[1] = q;
    delete p;
    delete q;
    delete [] q;
}
```

Question 5: Given `int x = 15`, and the following recursive function `fun(n, &ptr)`.

What is the value of `fun(5, &x)`?

```cpp
int fun(int n, int *f_p) {
    int t, f;
    if (n <= 1) {
        *f_p = 1;
        return 1;
    }
    t = fun(n-1, f_p);
    f = t+ * f_p;
    *f_p = t;
    return f;
}
```