COS 214 Class Test 1 - Pre-knowledge

UNIVERSITEIT VAN PRETORIA
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- This test takes place on **15th July 2019**.
- The maximum duration of this test is **40 minutes**.
- This test consists of **7 questions** for a total of **50 marks**.

Name and surname: _____

Student number: _____

Question 1 . . . .(6 marks)

Given the code below:

```cpp
const int a = 1;
const int *b = new int(2);
int *const c = new int(3);
int const *const d = new int(4);
int *e = new int(5);
```

For each of the statements below indicate whether that operation is valid or invalid by ticking in the correct cell.

Statement	Valid	Invalid
a = 8;		
*b = 9;		
*c = 10;		
d = c;		
e = b;		
e = c;		

Question 2 . . . .(5 marks)

Given the code below, answer the questions which follow.

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

int main() {
    int a = 10;
    int b = 9;
    double average = avg(a,b);
    cout << "The average of a & b is: " << average << endl;
}

double avg(int a, int b) {
    return (a + b) / 2;
}
```

2.1 The above code has a compile-time error. Explain what it is. (1)

_____

2.2 How would you fix the code so that the compile-time error does not occur again? (2)

_____

2.3 The average function (`avg`) returns a rounded average and not the actual average of the 2 integers. (2)
For example, `avg(9, 10)` returns 9 and not 8.5. What is the problem and how will you fix it?

_____

Question 3 . . . .(3 marks)
Consider the following program and answer the questions which follow.

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

int main() {
  char name[30];
  cout << "What is your name?" << endl;
  cin >> name;
  cout << "Your name is " << name << endl;
}
```

When the program is executed and `John Lennon` is entered when prompted for a name, the output is:
`Your name is John`.

3.1 Why did the output not correctly display the full name? (1)

_____

3.2 What could you do to solve this problem elegantly? (2)

_____

Question 4 . . . .(6 marks)
Using the following partially completed funtion, determine whether the given year is a leap year (true)
or not (false). Assume that a year is a leap year if it is divisible by 400. A year is also a leap year if it
is divisible by 4 but not by 100.

```cpp
bool isLeapYear(int year) {

}
```

Question 5 ....(4 marks)

For each of the following programs, what will the output be? You can write your answer next to the given code.

5.1 **#include** <iostream> (1)

```
int x = 10;

int main() {
    std::cout << x++ << std::endl;
}
```

5.2 **#include** <iostream> (1)

```
int x = 10;

int main() {
    int x = 20;
    std::cout << ++x << std::endl;
}
```

5.3 (2)
```
int counter = 0;
while(counter < 20) {
    if(counter = 10)
        cout << "Looping..." << endl;
    if(counter > 15)
        break;
    ++counter;
}
```
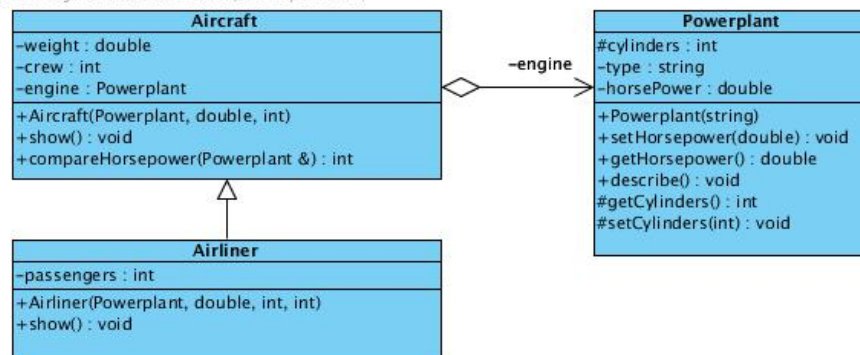
Question 6 ....(6 marks)

Write a *recursive* function to determine determine $n!$ for $n \geq 0$. Remember $n! = n*(n-1)*...*3*2*1$ and $0! = 1$.

Question 7 ....(20 marks)

Consider the following UML class diagram when answer the questions that follow.

7.1 Identify each of the following on the given UML class diagram.

    a) The visibility of the `weight` attibute/variable. (1)

    b) A class member function that is protected. (1)

    c) The visibility of the majority of the class members is .... (1)

    d) The relationship between `Aircraft` and `Airliner`. (2)

    e) The relationship between `Aircraft` and `Powerplant`. (1)

7.2 Write C++ code for the class definition of the Airliner class. (8)

7.3 Write the implementation of the constructor of the **Aircraft** class. (4)

7.4 Is it necessary to have a destructor defined in the class `Aircraft` or will the default destructor do? (2) Give a reason for your answer.