Object Oriented Programming using C++11 - OOP345ABC
Mid-Term Test - Winter Semester 2016

Student Name:_____

Student Number:_____ **Class Section:**_____

Question 1. (5 marks)

Write a pair of print function templates (C++ function templates were covered in OOP244):

1. The first 'print' function template has a C++ templated L-value reference parameter. It prints using cout (or wcout) the parameter value and the phrase "**L-Value**".

2. The second 'print' function template has a C++11 templated R-value parameter. It prints using cout (or wcout) the parameter value and the phrase "**R-Value**".

Write down the output from running the following code with your pair of function templates.

```
char broiled = 'X'; bool makes = true; double trouble = 665.;

print( broiled );
print( broiled + 2) ;
print( std::move(broiled) );
print( makes + trouble );
print( 2 + 10.6 );
print( L“C++11 is a better C++” );  // may require std::wcout in place of std::cout
```

Question 2. (15 marks total)

Consider a templated class X whose X.h file begins (NOTE templates never have a .cpp file):

```
#pragma once

template <class T>
class X {
  size_t size;
  T*     data;
public:
  // member functions, constructors, destructor, assignment operators, etc.
};
```

Add **(4 marks)**
a default constructor which leaves the object in a safe state.
a constructor with a size_t size parameter. It assigns 'data' to the dynamically allocated 'T' buffer of that size and stores the size in member variable size.
a destructor
a print member function which prints the object memory size. The size may be zero.

Add **(2 marks)**
the remaining member functions required to complete the C++ 'rule-of-three'

Add **(4 marks)**
the remaining member functions required to complete the C++11 'rule-of-five'

All member functions print a message on cout when they are called so you verify the correct function was called as expected.

Demonstrate you understand the 'rule-of-five'. Write sample code and show the expected output that exercises the rule-of-five member functions. Call print after executing a 'rule-of-five' member function. Include code that moves something with a large data size back and forth between a pair of objects. **(5 marks)**