The following exam is pledged. All answers are to be done on the answer sheet that is provided. The test is closed book and closed note.

Part I:

(1) A C++ style comment begins with // and continues to the _____

(2) Give the decimal value of the following 8-bit, two's complement number: 11111111.

(3) Negative numbers are usually stored in _____ representation.

(4) The _____ is the brains of a computer. It is where arithmetic and logical functions are performed.

(5) A _____ translates a programming language to machine language.

(6) _____ is a paradigm of programming in which a software system is modeled as a set of objects that interact with each other.

(7) The C++ operator >> is called the _____ operator.

(8) The manipulator _____ inserts a newline in the output stream. In doing so, it forces all the output that has been sent to the stream to be written to the corresponding device.

(9) A _____ return value by function `main()` indicates nonsuccessful execution.

(10) When a floating-point value is stored in an integer object, the floating-point value is converted to an integer value by _____ its value.

(11) True or False A binary digit is called a byte.

(12) True or False A bit is eight bytes.

(13) True or False Data members represent the properties or attributes of a class.

(14) True or False The statement `#include <iostream.h>` is a preprocessor directive that in part defines the error stream `cerr`.

(15) True or False The C++ object type `char` is used to represent a character.

(16) True or False Characters are normally encoded using the ASCII character set.

(17) True or False A C++ name consists of a sequence of letters, digits, and underscores. A valid name cannot begin with a digit character.

(18) True or False C++ names are case sensitive.

(19) True or False Integer division can produce a floating-point result.

(20) True or False The assignment operator is right associative and has lower precedence than the arithmetic operators.

(21) Before a function is invoked, it must be _____ or defined.

(22) One of the standard libraries defines an _____ macro that enables an integral/boolean expression to be evaluated. If the expression is false, the program is terminated.

(23) A logical expression that is being evaluated is subject to the _____ rule that states that once the overall value of an expression is known, evaluation ceases.

(24) The _____ statement is a method for organizing a collection of integral constants into a type.

(25) A _____ statement creates a new name for an existing type. Both the new and old names can be used in subsequent definitions.

(26) Information to a function is passed via _____.

(27) A function that does not return a value has type _____.

(28) The parameters in a function invocation are called the _____ parameters.

(29) A logical expression evaluates to true if the value of the expression is a _____ integer value.

(30) A _____ is a member function that is invoked when an object is to be created.

(31) True or False The statement `x += 5;` is equivalent to `x = x + 5;`

(32) True or False A mixed-mode arithmetic expression involves integral and floating-point operands. The integral operand is converted to the type of the floating-point operand, and the appropriate floating-point operation is performed.

(33) True or False A `continue` statement indicates that the body of the innermost loop that contains the statement is finished for the current iteration.

(34) True or False For the arithmetic operators, the precedence from highest to lowest is unary plus and minus; then multiplication, division, and remainder; and then addition and subtraction.

(35) True or False When a function is invoked, flow of control is transferred from the invoking function to the invoked function. When the invoked function completes, control is transferred back to the invoking function.

(36) True or False A function invocation creates a new activation record.

(37) True or False When a parameter is passed by reference, a copy of the object is passed to the called function. Any modifications made to the parameter by the called function change the copy, not the original object.

(38) True or False The versions of the copy constructor and member assignment operator supplied by the compiler perform deep copying.

(39) True or False The relationship has-a indicates inheritance.

(40) True or False A member initialization list is separated from the constructor parameter list by a colon.

(41) _____ parameters can be specified for trailing parameters only.

(42) _____ is when two or more functions have the same name.

(43) Member functions that return the value of an attribute of an object are called _____.

(44) Member functions that set or change the value of an attribute of an object are called _____.

(45) An _____ is a well-defined and complete data abstraction that uses the information-hiding principle.

(46) A default constructor requires _____ parameters.

(47) A _____ constructor initializes a new object to be a duplicate of a previously defined object.

(48) The client interface to a class object occurs in the _____ section of the class definition.

(49) A new class that is created from an existing class using inheritance is called a _____ class.

(50) Class members of a _____ section are intended to be used only by other members of the class.

(51) True or False The size of the array is given as a bracketed expression whose value is derived from run-time constants.

(52) True or False In an array, each element has its own subscript value. The first element in the array has a subscript of 1, the second element has a subscript of 2, and so on.

(53) True or False An array is a first-class object.

(54) True or False An array element is a first-class object.

(55) True or False The elements of an array can be stored in noncontiguous memory.

(56) True or False In `C++` multidimensional arrays, the array elements are always stored in row-major order.

(57) True or False Elements of a local array whose base type is a numeric type are initialized by default to 0.

(58) True or False With multiple inheritance, a derived class inherits the attributes and behaviors of all parent classes.

(59) True or False Any member of a class is accessible to all of the other members of that class.

(60) True or False If a class does not define a member assignment operator, the compiler automatically supplies one.

(61) ADT libraries often contain _____ functions and operators that are not part of the ADT class, but do provide behavior that is expected with the objects.

(62) Elements of an array whose base type is a class type are initialized using the _____ constructor of the base type.

(63) When defining a function with an array parameter, the _____ parameter definition does not need to include the size of the first dimension.

(64) Give the decimal value of the hexadecimal number: A32E.

(65) Give an insertion statement that displays a single backslash.

(66) Give a single assignment statement that is equivalent to

```
i = j;
j += 1;
```

(67) Give the truth table for the following logical expression (*not P*) *and Q*

(68) Suppose we want to sort three numbers. How many different orderings can there be?

(69) Write a code segment that does the following:

(a) Defines a integer constant `N` equal to 20.

(b) Defines an array `A` whose base type is integer that can represent at most `N` values.

(c) Sets the first element of `A` to the value 19.

(d) Sets the last element of `A` to the value 54.

(e) Displays all of the elements of `A`.

(70) Given the following declarations:

```
char s[6] = "abcde";
```

(a) What is the output of following code segment?

```
cout << s << endl;
```

(b) What is the output of following statement?

```
for (int i = 0; i < 5; ++i) {
   cout << s[i] << endl;
}
cout << endl;
```

(71) For the following program:

```
int main() {
   char c = 'c';
   char d = 'd';
   cin >> c;
   cin >> d;
   cout << "c = " << c << " d = " << d << endl;
   return 0;
}
```

(a) What is the output if the standard input stream contains the following?

```
ab
c
d
```

(b) What is the output if the standard input stream contains the following?

```
a
b
c
d
```

(72) Consider the following code segment:

```
int i = 1;
while (i <= n) {
   ++i;
   cout << i << endl;
}
```

(a) What is the output if `n` is 0?

(b) What is the output if `n` is 1?

(73) What is the problem with the following code fragment?

```
int Max = 10;
int array[Max];
for (int i = 0; i < Max; ++i) {
   array[i] = 0;
}
```

(74) Given the following definition, state for each expression whether the expression is valid as a parameter in a function invocation.

```
char gizmo[12][13][4];
```

(a) `gizmo`
(b) `gizmo[3][2]`
(c) `gizmo[][4][2]`
(d) `gizmo[2][2][2]`
(e) `gizmo[7]`

(75) What does the following correct program display?

```
void f(int i, int array[]) {
   i = 5;
   array[0] = 5;
}
int main() {
   int i = 0;
   int array[1] = { 0 };
   f(i, array);
   cout << "i = " << i << "\n" << "array[0] = " << array[0] << "\n";
   return 0;
}
```

(76) Given the following definitions, indicate which of the assignments are legal assignments with respect to the array `A` or its elements.

```
int A[5][5];
int B[3][5];
```

(a) `A = B;`
(b) `A[0][0] = B[2][3];`
(c) `A[3] = B[1];`
(d) `A[2][4] = B[1][1];`
(e) `A[5][5] = B[0][0];`

(77) For the following code segment, how many times are the characters, `'A'`, `'B'`, `'C'`, `'D'`, and `'E'` displayed?

```
cout << 'A';
for (int i = 0; i < 3; ++i) {
   cout << 'B';
   for (int j = 0; j < 4; ++j) {
      cout << 'C';
   }
   cout << 'D';
}
cout << 'E';
```

(78) What does the following correct program output?

```
#include <iostream.h>
class Numbers {
   public:
      Numbers (const int value);
      int sum(int which1, int which2);
      int read(int index );
   private:
      int m[100];
};
Numbers::Numbers( const int value ) {
   for (int i = 0; i < 100; ++i) {
      m[i] = value + i;
   }
}
int Numbers::sum(int which1, int which2) {
   return m[which1] + m[which2];
}
int Numbers::read(int index) {
   return m[index];
}
void main() {
   Numbers n(100);
   for (int i = 0; i < 3; ++i) {
      cout << n.read(i) << " ";
   }
}
```

(79) Consider the classes `Hoo` and `Wahoo`. Identify errors on three different lines and explain them.

```
S1.   class Hoo {
S2.      public:
S3.         Hoo( );
S4.         Hoo( &int n );
S5.         int Hoo( int n, int m );
S6.      protected:
S7.         int HooYear;
S8.         int HooTime;
S9.      private:
S10.        int HooDay;
S11.  };
S12.  class Wahoo : public Hoo {
S13.     public:
S14.        Wahoo(int n, int m);
S15.  };
S16.  Wahoo::Wahoo(int time, int day ) {
S17.     HooTime = time;
S18.     HooDay = day;
S19.  }
```

(80) For the following class hierarchy:

```
class Top {
   public:
      Top ();
      int look();
   protected:
      int peek();
   private:
      int value;
};
class A: public Top {
   // ...
};
class B: private Top {
   // ...
};
class C: protected A, public B {
   // ...
};
```

which of the functions and data members in `Top` can be accessed from the derived classes.

(81) Complete the `void` function `Swap()` that interchanges the values of its two `Rational` reference parameters.

(82) Complete the `Rational` auxiliary function operator `++` so that it increments its reference `Rational` parameter `r` by 1. The operator should do a reference return of the value it computes.

(83) Complete the `int` function `Count()` which has three `const` parameters `A`, `n`, and `V`. Array `A` is an `int` single-dimension array and `n` is the number of elements to be processed. `V` is the object whose number of occurrences we want to count. Function `Count()` returns the number of elements that are equal to `V`.

(84) Consider a class `Vehicle`, which has two public constructors, one which takes no parameters, and another which takes a single integer value parameter `x`. `Vehicle` should provide a parameterless member function, `get()`, accessible only to the `Vehicle` class or classes derived from `Vehicle` (this member does modify any of the members of the class). `Vehicle` should provide a boolean member function `charged()`, callable by any other function (this member does modify any of the members of the class). `Vehicle` should provide another member function, `set`, that takes a single integer parameter `s` and returns `void`, and is only accessible to objects of `Vehicle` class (this member may modify members of the class). Integer data member `MyTurbo` should be accessible only to objects of type `Vehicle`. Complete the class definition for the class `Vehicle`.

(85) Complete the code segment that produces a 50 by 50 integer array `A`, such that all elements other than those in the column with index 5 are set to 0; the elements in the column with index 5 are set to 1.

(86) On iteration `i`, the task of `InsertionSort()` is to place the value of array element `A[i]` correctly with respect to the previously arranged values of array elements `A[0]` through `A[i-1]`. Complete the definition of `InsertionSort()`.