FORM 2

CS 162 Exam II

True (A) / False (B) (2 pts)

1. A new node cannot become the first node in the list. F

2. The Standard Template Library (STL) contains templates for useful algorithms and data structures. T

3. A sequential container organizes data in a sequential fashion, similar to an array or linked list. F

4. Inserting an item into a linked list requires that all the items past the point of the insertion be shifted to make room for the new item. F

5. At most one catch block may be attached to a single try block. F

6. The values stored in the value portion of a node of a linked list can be simple data types, structures, objects of classes, or any other data type. T

7. When you create a vector it is unnecessary to specify how many elements it will hold because it will expand in size as you add new values to it. T

8. If an exception is not caught, it is stored for later use. F

9. Deleting an entire linked list requires a call to the delete operator for each node in the list. F

10. The C++ mechanism for exception handling encloses code that might throw an exception in a try block and puts exception handling code in catch blocks attached to the try block. T

11. There is no difference between defining an object of an ordinary class and an object of a template class. F

12. When you create a linked list, you must know in advance how many nodes the list will contain. F

13. Nodes in a linked list are stored in contiguous memory. F

14. The STL vector and list classes are examples of sequential containers. T

15. The following statement adds a new element to the department vector at index 25.
   ```cpp
department.push_back(25);
   ``` F

16. An exception is a condition that can be caused by a syntax error in the program. F

17. Using a function template often requires writing less code than overloading a function. T
Multiple Choice (3 pts):

18. _______ to a base class may be assigned the address of a derived class object.
   A) Static members
   B) Access specifiers
   C) Pointers
   D) Private members
   E) None of the above

19. Which of the following operations do constant iterators not have?
   A) Prefix operator* to make available the container element for use as l-value or r-value.
   B) Overloaded binary operator+ to add an int value to the iterator to move the place the
      iterator points forward by the argument number of elements.
   C) Overloaded unary operator++ to move the place the iterator points forward by one
      element.
   D) Overloaded unary operator-- to move the place the iterator points backward by one
      element.
   E) Overloaded operator== and operator!= to determine whether two iterators point to the
      same element.

20. Linked lists of items are commonly implemented by
   A) using a class template to represent list items.
   B) using a function to compute the link to the next item.
   C) using an array to hold list items.
   D) using a structure containing an item and a pointer to the structure type.
   E) None of the above

21. In the statement template <class T>, what does the word class indicate?
   A) A class called T will automatically be created by the compiler.
   B) You are deriving a class from an existing class called T.
   C) class is a keyword that indicates that T is a type parameter.
   D) You are deriving a class called T from a class called template.
   E) None of the above

22. The bad_alloc exception is thrown
   A) by the new operator.
   B) only when the program contains a catch block.
   C) when program code encounters a bad memory location.
   D) when you forget to free memory with the delete operator.
   E) None of the above

23. Types of iterators are
   A) reverse
   B) random-access.
   C) forward and bidirectional.
   D) All of the above
   E) None of the above
24. A(n) ________ is like a pointer. It is used to access the individual data elements in a container.
   A) subscript indicator
   B) element access operator
   C) iterator
   D) global data finder
   E) None of the above

25. A(n) ________ is used in a function template to specify a generic data type.
   A) type parameter
   B) dummy variable
   C) catch block
   D) exception
   E) None of the above

26. If the head pointer points to NULL, it is an indication that
   A) the list needs to be destroyed.
   B) the list is full and cannot accept any new nodes.
   C) the list has been destroyed.
   D) there are no nodes in the list.
   E) None of the above

27. Declaring a member function of a class to be a ________ will cause the C++ compiler to use dynamic binding.
   A) virtual function
   B) static function
   C) constructor function
   D) destructor function
   E) None of the above

28. A ________ is used to step through a linked list and search for data.
   A) node
   B) NULL value
   C) traversal operator
   D) pointer
   E) None of the above

29. To catch an exception, a program must
   A) have a try/catch construct.
   B) have a throw() function.
   C) first experience an unrecoverable error.
   D) first experience a fatal error.
   E) None of the above
30. Polymorphism in C++ will not work unless ________.
   A) the members of the class are public
   B) the <polymorphic> header file is included
   C) pointers or references are being used
   D) All of the above
   E) None of the above

31. In a function template, the programmer substitutes ________ for ________.
   A) angle brackets, parentheses
   B) parameters, data types
   C) parameters, arguments
   D) arguments, parameters
   E) None of the above

32. How much memory is reserved for a function template?
   A) four bytes
   B) no memory
   C) two bytes
   D) eight bytes
   E) None of the above

33. Which of the following does not refer to the same topic?
   A) Late binding
   B) Virtual functions
   C) Polymorphism
   D) Static binding
   E) none of the above

34. An exception is propagated
   A) From a place where the error occurs to the handler in the catch block.
   B) From the throw statement buried in the try block to the handler in the catch block.
   C) From a throw statement, not in a try block to the handler in the catch block.
   D) From the catch block to the try block.
   E) From the handler in the throw block to the try block.

35. The algorithms provided by the STL are implemented as ________, and perform various operations on elements of containers.
   A) virtual functions
   B) private data members
   C) function templates
   D) global variables

36. I have a pointer, nodePtr to a node that is a struct in a linked list. I want to access the member named data. I do this using the expression
Suppose we have the following definition:

```cpp
vector<int> vec(5);
vector<int>::iterator p = vec.begin();
vector<int>::const_iterator q = vec.begin();
```

Which of the following expressions is not legal? Treat the effect of these as non-cumulative.

A) *p = 1;
B) *q = 1;
C) p = vec.end();
D) q = vec.end();

An abstract class is

A) one that has all of its member functions declared private.
B) one that has all of its member variables declared private.
C) one that has at least one pure virtual function.
D) one that supports polymorphism.
E) None of the above

An abstract class is somewhat restricted in how it can be used because

A) all of its members must be public.
B) it cannot use dynamic binding for its member functions.
C) the compiler does not allow objects of the class to be created.
D) it cannot use static binding for its member functions.
E) None of the above

Extra Credit (2 pts):

I have an algorithm that runs in \( O(N^{1/2}) \), where \( N \) is the size of the problem. For \( N = 100 \), the time the algorithm runs is 1 minute. How long does the algorithm take for \( N = 1000 \)?

Hint: \( \sqrt{1000} \) is approximately 31.6.

A) Same time
B) About 3 minutes
C) About 10 minutes
D) About 30 minutes
E) You haven’t given enough information. I can’t tell.

True (A)/False (B): Insertion into a vector runtime is \( O(1) \) at any position in the vector. This means that inserting into a vector is constant time and does not depend on the number of elements in the vector.

True (A)/False (B): In a non-empty list, there must be exactly one list item with no successor.
43. The code for a template function is generated when:
   A) The function template declaration (prototype) appears in the C++ program.
   B) The function template is encountered in the C++ program.
   C) The function call is encountered in the C++ program.
   D) At runtime, when the function call is executed.

44. True (A)/False (B): Suppose the swapValue template is instantiated as follows:
    ```
    int x = 2, y = 3;
    swapValue(x, y);
    double d = 3.0, f = 4.5;
    swapValue(d, f);
    ```
    Then the compiler generates code for two copies of the swapValue template.