1. **What is the primary purpose of a destructor in C++?**
    A. To initialize object data members
    B. To release resources and perform cleanup when an object is destroyed
    C. To create copies of objects
    D. To overload operators
    E. None of the above

2. **Virtual functions in C++ are primarily used to achieve:**
    A. Runtime polymorphism
    B. Compile-time polymorphism
    C. Data hiding
    D. Multiple inheritance
    E. None of the above

3. **Function overriding occurs when:**
    A. Two functions have the same name in the same class
    B. Derived class redefines a base class function
    C. Two functions have different parameters
    D. A function is declared virtual
    E. None of the above

4. **In C++, exception handling is implemented using the keywords:**
    A. try, catch, throw
    B. handle, error, throw
    C. begin, rescue, end
    D. check, except, raise
    E. None of the above

5. **Operator overloading allows you to:**
    A. Create new operators
    B. Change the precedence of operators
    C. Define custom behavior for operators with user-defined types
    D. Use operators in templates only
    E. None of the above

6. What will be the output of the following code:

```
#include <iostream>
using namespace std;
int main() {
    int x = 10, y = 20;
    if (x < y && x + y > 25)
        cout << "Condition 1 ";
    else if (x == 10 || y == 20)
        cout << "Condition 2 ";
    else
        cout << "None";
    return 0;
}
```

A. Condition 1 Condition 2

B. Condition 1

C. Condition 2

D. None

E. None of the above

7. What will be the output of the following code:

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

int main() {
    for (int i = 1; i <= 10; i++)
    {
        i++;
        cout << i << " ";
    }
    return 0;
}
```

A. 2 4 6 8 10

B. 1 2 3 4 5 6 7 8

C. 1 2 3 4 5 6 7 8 9 10

D. 1 3 5 7 9

E. None of the above

8. What will be printed by the following code?

```
int a=1;
a++;
++a;
a=a+1;
a+=1;
cout<<a;
```

A. 2
B. 3
C. 4
D. 5
E. None of the above

9. Which of the following statements is true about the do-while loop?

A. It executes only if the condition is true
B. It executes at least once regardless of the condition
C. It does not require a semicolon at the end
D. It cannot contain a break statement
E. None of the above

10. Which loop is preferred when the number of iterations is known beforehand?

A. for loop
B. while loop
C. do-while loop
D. infinite loop

11. Which insertion order into an empty AVL tree causes a left-right imbalance at the root, requiring a left-right rotation?

A. 30, 20, 10
B. 30, 10, 20
C. 10, 20, 30
D. 20, 10, 30
E. None of the above

12. A hash table of size 7 uses h(k) = k mod 7 and linear probing, with indices numbered 0 through 6. After inserting the keys 10, 17, 24, and 31 in that order, at which index will 31 be stored?

A. 3
B. 4
C. 5
D. 6
E. None of the above

13. What is the time complexity of accessing the element at index i in an array?

A. O(1)
B. O(log n)
C. O(n)
D. O(n log n)
E. None of the above

14. In a binary search tree, which traversal visits the keys in sorted order?

A. Preorder
B. Inorder
C. Postorder
D. Level-order
E. None of the above

15. Which data structure is most suitable for modeling a waiting line at a ticket counter?

A. Stack
B. Queue
C. Heap
D. Graph
E. None of the above

16. If a set has 4 elements, how many subsets does it have?

A. 8
B. 12
C. 16
D. 24
E. None of the above

17. A relation that is reflexive, symmetric, and transitive is called a:

A. Partial order
B. Equivalence relation
C. Function
D. Bijection
E. None of the above

18. How many edges are in the complete graph K_6 ?

A. 12
B. 15
C. 18
D. 30
E. None of the above

19. How many binary strings of length 5 have exactly two 1s with no adjacent 1s?

A. 3
B. 4
C. 5
D. 6
E. None of the above

20. How many onto functions are there from a 3-element set to a 2-element set?

A. 2
B. 4
C. 6
D. 8
E. None of the above