1. Write your name on your scantron in the space labeled NAME.
2. Write your CRN number in the space labeled HOUR.
3. Write the date in the space labeled DATE.
4. Write the handwritten test number of this test (upper right) in the space labeled TEST NO.
5. You must return test questions to your instructor.
6. You may not consult your neighbors, colleagues, or fellow students to answer the questions on this test.
7. Reference materials are prohibited. You may not refer to class notes or the text during this test.
8. Mark all selections that satisfy the question. If selection b, c, and d satisfy a question then mark selections b, c, and d.
9. Answer all 35 questions.
10. You may use a hand calculator.
11. You write on your test.

Test Number: ________________________
1. A constructor has the same
   a. type as the class
   b. name as the class
   c. parameters as the class
   d. member data as the class

2. Which of the following is syntactically correct given the declaration is Figure 2?
   a. \( T::T():(0),d(0.0),c(‘c’)){} \)
   b. \( T::T():i=0;d=0.0;c=‘c’;{} \)
   c. \( T::T():i=0,d=0.0,c=‘c’;{} \)
   d. \( T::T():i=0,d=0.0;c=‘c’;{} \)

```cpp
class T {
    int i;
    double d;
    char c;
    public:
        T();
};
```

**Figure 2.** Declaration for Question 2.

3. A certain class requires a dynamically allocated array of floating-point numbers. Which declarations
   of private member F are suited to this purpose?
   a. real* F;
   b. float F;
   c. long double* F;
   d. none of the above

4. Which of the following statements correctly allocates storage for an array of floating-point numbers?
   a. \( F=new\ real[100];\)
   b. \( F=(float*)alloc(100,\text{sizeof float});\)
   c. \( F=alloc\ long\ double\ 100;\)
   d. \( F=new\ double[100];\)

5. Where is it appropriate to allocate storage?
   a. in the allocator
   b. in the constructor
   c. in a member function
   d. in private member data

6. A member function that is never declared with a return data type and can never have arguments is
   a. the constructor
   b. the destructor
   c. the default constructor
   d. none of the above

7. Constructor functions have the same name as the
   a. class
   b. class instance
   c. program
   d. none of the above
8. A constructor that requires no arguments is called
   a. a default constructor
   b. an overloaded constructor
   c. a null constructor
   d. none of the above

9. What does the program in Figure 9 print?
   a. 20 20 50
   b. 20 50 20
   c. 50 20 20
   d. none of the above

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

class Tank {
   int gallons;

   public:
      Tank():gallons(50) {}
      Tank(int g):gallons(g) {}
      int GetGallons(void){return gallons; }
};

test 1

int main()
{
   Tank T1,T2,T3(20);
   cout << endl;
}
```

**Figure 9.** Program for question 9.
10. What does the program in Figure 10 print?
   a. I am a blouse and my size is 7. I am a shirt and my size is 10.
   b. I am a blouse and my size is 10. I am a shirt and my size is 7.
   c. I am a shirt and my size is 7. I am a blouse and my size is 10.
   d. I am a shirt and my size is 10. I am a blouse and my size is 7.

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

class Garment {
    char* kind;
    int size;

public:
    Garment(char* k="shirt", int sz=5):size(sz) {
        int l=strlen(k);
        kind=new char[l+1];
        strcpy(kind,k);
        cout << "  I am a " << kind << " and my size is " << size << ",";
    }
    ~Garment() {
        if (kind) delete[] kind;
    }
};

test main() {
    Garment Shirt("shirt",10);
    Garment Blouse("blouse",7);
    return 0;
}
```

Figure 10. Program for Question 10

11. Which acronyms best describe a stack?
   a. FIFO
   b. LIFO
   c. FOFI
   d. FOLI

12. Which acronyms best describe a queue?
   a. FIFO
   b. LIFO
   c. FOFO
   d. FOLI
13. What does the program in Figure 13 print?
   a. The
   b. cow
   c. bovine
   d. ilk

14. What is the value of the expression `tos->prev->prev->prev->id` if its evaluated just before the `return` statement at the end of function `main`?
   a. The
   b. cow
   c. bovine
15. What does function `strlen` return when called by constructor `Element` in the statement `Element* e = new Element(tos,"Sweet T");`?
   a. “Sweet T”
   b. `tos`
   c. 7
   d. 8

```
Stack
+---+---+---+
| size | S   | tos |
+---+---+---+
```

![Figure 16. Diagram for questions 16, 17 and 18.](image)

16. Which declaration(s) can be used to represent the private member data of class `Stack` shown in Figure 16?
   a. `class Stack { int size; char S[8]; int tos; public: ... };
   b. `class Stack { int size; int S[8]; int tos; public: ... };
   c. `class Stack { int size; char* S; int tos; public: ... };
   d. `class Stack { int size; int* S; int tos; public: ... };

17. Which of the program(s) can be used to create data shown in Figure 16?
   a. `int main() { Stack S; S.Push('e'); S.Push('x'); S.Push('a'); S.Push('m'); return 0; };`
   b. `int main() { Stack S; S.Push("exam"); return 0; }`
   c. `int main() { Stack S(8); S.Push('m'); S.Push('a'); S.Push('x'); S.Push('e'); return 0; };`
   d. `int main() { Stack S; S.Push("maxe"); return 0; }

18. What are correct values for members `size` and `tos` in Figure 16?
   a. `size=9, tos=2`
   b. `size=8, tos=3`
   c. `size=7, tos=4`
   d. `size=6, tos=5`

19. When is storage for a stack implemented as a dynamically allocated array allocated and reclaimed?
   a. Storage is allocated when elements are pushed on to the stack and reclaimed when elements are popped from the stack or control flow passes out of the locality where the stack was declared.
   b. Storage is allocated when elements are pushed on to the stack and reclaimed when control flow passes out of the locality where the stack was declared.
   c. Storage is allocated when the stack is declared and reclaimed when elements are popped from the stack or control flow passes out of the locality where the stack was declared.
   d. Storage is allocated when stack is declared and reclaimed when control flow passes out of the locality where the stack was declared.

20. When is storage for a stack implemented as a dynamically allocated linked list of elements allocated and reclaimed?
   a. Storage is allocated when elements are pushed on to the stack and reclaimed when elements are popped from the stack or control flow passes out of the locality where the stack was declared.
   b. Storage is allocated when elements are pushed on to the stack and reclaimed when control flow passes out of the locality where the stack was declared.
   c. Storage is allocated when the stack is declared and reclaimed when elements are popped from the stack or control flow passes out of the locality where the stack was declared.
   d. Storage is allocated when stack is declared and reclaimed when control flow passes out of the locality where the stack was declared.

21. Consider Figures 21. a., 21. b., 21. c. and 21. d. Which Figure(s) contain instructions to create program `p00` that exercises class `Clock`? Instructions in the figures are processed by the Unix utility `make`.

```
p00:   p00.o Clock.o
       g++ -o p00 p00.o Clock.o -lm
p00.o: p00.cpp Clock.h
       g++ -c -g p00.cpp
Clock.o: Clock.cpp Clock.h
       g++ -c -g Clock.cpp
```

**Figure 21. a.**

```
p00:   p00.o Clock.o
       g++ -o p00 p00.cpp Clock.cpp -lm
p00.o: p00.cpp Clock.h
       g++ -c -g p00.cpp
Clock.o: Clock.cpp Clock.h
       g++ -c -g Clock.cpp
```

**Figure 21. b.**
22. What are the first two characters of a comment in a file processed by the Unix utility make?
   a. //
   b. /*
   c. --
   d. #-

23. What is the character shown as white space that precedes an instruction line in a file processed by the Unix utility make?
   a. The space character (SP) ASCII code 2016.
   b. The tab character (HT) ASCII code 916.
   c. The carriage return character (CR) ASCII code 1316.
   d. None of the above

24. Which function prototype(s) for function main are correct?
   a. void main(char** argv, int argc);
   b. int main(int ac, char** av);
   c. int main(char* av[]);
   d. void main(int argc, char* argv[]);

25. Which comparisons are true given the command line shown in Figure 25?
   a. argc==5 && argv[0][2]=='I'
   b. argv[0][0]=='.', & && argv[4][3]=='.',
   d. argv[0][1]==`' && argc==5

26. Assume variable ifn contains a file name. Which statement(s) correctly open an existing text file?
   a. FILE* i=fopen(ifn,"r");
   b. ifstream i(ifn);
   c. FILE i(ifn);
   d. ifstream i=fopen(ifn,"r");
27. Which statement(s) allocate an array large enough to store 10 complex numbers? A complex number is defined in Figure 27.
   a. `Complex* x=new Complex[10];`
   b. `Complex x=new Complex[10];`
   c. `Complex* x=Complex new[10];`
   d. `Complex x=Complex new[10];`

```c
struct Complex {
    double re,im;
};
```

**Figure 27.** Complex number definition for question 27.

28. Which statement(s) reclaim storage for the array allocated in question 27.
   a. `dispose x[];`
   b. `delete[] x;`
   c. `dispose[] x;`
   d. `delete x[];`

29. A palindrome is
   a. writing material used one or more times after earlier writing has been erased.
   b. an ode or song recanting or retracting something in an earlier poem.
   c. a string that reads the same forward or backward.
   d. a fence of stakes.

| List | | |
|------|---|---|---|---|---|---|
| 17   | 3   | 29  | -6  | 14  | 0   |     |     |

**Figure 31.** Unsorted List for question 30

30. Array L in Figure 30 will be sorted using a selection sort. What is the sequence of values for variable `iom`, the index of the maximum element?
   a. 5 4 3 2 1
   b. 1 2 3 4 5
   c. 2 0 0 1 1
   d. none of the above

31. Array L in Figure 30 will be sorted using a selection sort. What is the sequence of values for variable `eol`, the end of list?
   a. 5 4 3 2 1
   b. 1 2 3 4 5
   c. 2 0 0 1 1
   d. none of the above
```cpp
void crlprint(char* c, int r, int l)
{
    cout << endl;
    cout << r << " " << c[r] << " " << l << " " << c[l];
}

bool IsPalindrome(char* c)
{
    int r = 0, l = strlen(c) - 1;
    while (r < l) {
        if (c[r] != c[l]) {
            crlprint(c, r, l);
            return false;
        }
        r++; l--;
    }
    crlprint(c, r, l);
    return true;
}
```

**Figure 43.** Function for problems 43 and 44.

32. What is printed by function `crlprint` in Figure 43 when function `IsPalindrome` is called with parameter `c` referencing a value of “able_elba”
   a. 5 _ 5 _
   b. 4 _ 4 _
   c. 3 _ 3 _
   d. none of the above

33. What is printed by function `crlprint` in Figure 43 when function `IsPalindrome` is called with parameter `c` referencing a value of “othelhto”
   a. 3 e 4 l
   b. 0 o 7 o
   c. 1 t 6 t
   d. none of the above

34. Which of the following are correct implementations of function `Stack::IsEmpty` for a stack that employs a dynamically allocated array to store elements?
   a. `bool Stack::IsEmpty(void) { return count==0; }
   b. `bool Stack::IsEmpty(void) { return tos==-1; }
   c. `bool Stack::IsEmpty(void) { return tos==size-1; }
   d. `bool Stack::IsEmpty(void) { return count==size-1; }
   e. 

35. Which of the following are correct implementations of function `Stack::IsFull` for a stack that employs a dynamically allocated array to store elements?
   a. `bool Stack::IsFull(void) { return count==size; }
   b. `bool Stack::IsFull(void) { return tos==size; }
   c. `bool Stack::IsFull(void) { return tos==size-1; }
   d. `bool Stack::IsFull(void) { return count==size-1; }
   e.