The University of Alabama in Huntsville
Electrical and Computer Engineering
CPE 112 02
Final Exam
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Name: _____

Posting Code: _____

True or False (1 point each)

1. _____ There is only one unique general solution (algorithm) for a given problem.
2. _____ The compiler is a program that translates a high-level language program into machine code.
3. _____ Every C++ program must have a function named `main`.
4. _____ A(n) _____ is a location in memory, referenced by an identifier, where a data value that cannot be changed is stored.
5. _____ In a C++ expression without parentheses, all operations are performed in order from left to right.
6. _____ The single statement

```
cin >> alpha >> beta;
```

may be used in place of the two statements

```
cin >> alpha;
cin >> beta;
```

7. _____ The `>>` operator skips leading whitespace characters when looking for the next data value in the input stream.
8. _____ If P and Q are logical expressions, the expression P AND Q is TRUE if either P or Q is TRUE or both are TRUE.
9. _____ The code segment

```
if (speed <= 40)
    cout << "Too slow";
if (speed > 40 && speed <= 55)
    cout << "Good speed";
if (speed > 55)
    cout << "Too fast";
```

could be written equivalently as

```
if (speed <= 40)
    cout << "Too slow";
else if (speed <= 55)
    cout << "Good speed";
else
    cout << "Too fast";
```

10. _____ An infinite loop is one in which the While expression always has the value `false`.

11. _____ It is possible to supply different argument names every time a function is called.

12. _____ Using global variables is better style than using local variables.

13. _____ If a loop containing a `break` statement is nested within a Switch statement, execution of that `break` statement causes an exit from the loop but not from the Switch statement.

14. _____ In C++, the expressions `beta++` and `++beta` can always be used interchangeably.

15. _____ C++ allows an array to be a member of a `struct`.

16. _____ The components of an array are all of the same data type.

17. _____ Given the declaration

```
int beta[20];
```

the statement

```
beta = beta + 1;
```

adds 1 to all 20 elements of the array.

Fill in the Blank (1 point each)

18. Coding of an algorithm takes place during the _____ phase of a computer program's life cycle.

19. A(n) _____ is a step-by-step procedure for solving a problem in a finite amount of time.

20. A(n) _____ is a name associated with a function or data object and used to refer to that function or data object.

21. The implicit (automatic) conversion of a value from one data type to another is called _____.

22 The C++ standard library defines a data type named _____ that represents a stream of characters going to an output file.

23. _____ is a technique for developing a program in which the problem is divided into more easily handled subproblems, the solutions of which create a solution to the overall problem.

24. Write a C++ logical expression that is `false` if either `x` or `y` is equal to 5:

_____

25. A(n) _____ is an input statement located before the While loop that processes its input data.

26. A(n) _____ is a variable declared in a function heading.

27. The _____ of an identifier is the region of program code where it is legal to reference that identifier.

28. A Switch statement, like an If statement, is a(n) _____ control structure.

29. A(n) _____ is a user-defined data type whose domain is an ordered set of literal values expressed as identifiers.

30. _____ is the conversion of a value from a "lower" type to a "higher" type according to a programming language's precedence of data types.

31. A record in which at least one of the components is itself a record is called a(n) _____ record.

32. Given the declarations

```
typedef char String30[31];
struct BookType
{
String30 title;
String30 author;
String30 publisher;
};
BookType aNovel;
```

write a statement to print the author of `aNovel`:

_____

33. An operation on a data structure as a whole, as opposed to an operation on an individual component, is called a(n) _____ operation.

34. Write the declaration statement for a 25-element one-dimensional array named `letterGrade` whose component type is `char`: _____

Multiple Choice (1 point each)

35. _____ Which of the following most closely resembles human language?

a. a high-level language
b. a machine language
c. an assembly language

36. _____ Which of the following terms describes the execution of a series of statements (instructions) one after another?

a. sequence
b. selection
c. looping
d. subprogram

37. _____ Which one of the following is *not* a valid identifier in C++?

a. `Hi_There`
b. `top40`
c. `UpAnDdOwN`
d. `3BlindMice`
e. `CAPS`

38. _____ After execution of the code fragment

```
int arr[5];
int i;

for (i = 0; i < 5; i++)
{
    arr[i] = i + 2;
    if (i >= 3)
        arr[i-1] = arr[i] + 3;
}
```

what is contained in `arr[1]`?

a. 2
b. 3
c. 7
d. 8
e. none of the above

39. _____ Given the nested For loops

```
for (i = 0; i < M; i++)
    for (j = 0; j < N; j++)
        cout << table[i][j];
```

what is the appropriate declaration for `table`?

a. `int table[M][N];`
b. `int table[N][M];`
c. `int table[M+N];`
d. `int table[M+1][N+1];`
e. `int table[N+1][M+1];`

40. _____ The value of the C++ expression `3 / 4 * 5` is:

a. 0.0
b. 0
c. 3.75
d. 3
e. 0.15

41. _____ What is the output of the following program fragment?

```
age = 29;
cout << "Are you" << age << "years old?" << endl;
```

a. `Are you29years old?`
b. `Are you 29 years old?`
c. `Are you29 years old?`
d. `Are you 29years old?`
e. `Are you age years old?`

42. _____ Given the constant declaration

```
const int FACTOR = 95;
```

which of the following is *not* a valid use of `FACTOR`?

a. `cout << FACTOR * 3;`
b. `FACTOR = 24;`
c. `cin >> FACTOR;`
d. a and c above
e. b and c above

43. _____ If `p` is a Boolean variable, which of the following logical expressions always has the value `false`?

a. `p && p`
b. `p || p`
c. `p && !p`
d. `p || !p`
e. b and d above

44. _____ What is the value of `loopCount` after control exits the following loop?

```
loopCount = 1;
while (loopCount <= 145)
{
     alpha = alpha + 7;
     loopCount++;
}
```

a. 1
b. 144
c. 145
d. 146

45. _____ Parameter passage by value is used if a parameter's data flow is

a. one-way, into the function.
b. one-way, out of the function.
c. two-way, into and out of the function.
d. a and b above
e. b and c above

46. _____ What is the output of the following code fragment? (`finished` is a `bool` variable, and `firstInt` and `secondInt` are of type `int`.)

```
finished = false;
firstInt = 3;
secondInt = 20;
while (firstInt <= secondInt && !finished)
 if (secondInt / firstInt <= 2)  // Reminder: integer division
        finished = true;
 else
        firstInt++;
 cout << firstInt << endl;
```

a.3
b.5
c.7
d.8
e.9

47. _____ A function `SomeFunc` has two parameters, `alpha` and `beta`, of type `int`. The data flow for `alpha` is one-way, into the function. The data flow for `beta` is two-way, into and out of the function. What is the most appropriate function heading for `SomeFunc`?

a. `void SomeFunc( int alpha, int beta )`
b. `void SomeFunc( int& alpha, int beta )`
c. `void SomeFunc( int alpha, int& beta )`
d. `void SomeFunc( int& alpha, int& beta )`

48. _____ Given the function definition

```
int Trans( /* in */ int alpha,
           /* in */ int beta  )
{
    if (alpha > beta)
        return alpha + 10;
    else
        return 2 * beta;
}
```

what is printed by the following code?

```
cout << Trans(5, Trans(9, 4)) << endl;
```

a.15
b.38
c.16
d.19
e.8

49. _____ A `struct` is an example of:

a.a simple data type
b.a homogeneous structured type
c.a heterogeneous structured type
d.an enumeration type

50. _____ How many iterations does the following For loop execute? (`count` is of type `int`.)

```
for (count = 0; count <= 20; count++)
    DoSomething();
```

a. 18
b. 19
c. 20
d. 21
e. infinitely many

51. _____ What is the output of the following code fragment? (All variables are of type `int`.)

```
n = 2;
for (loopCount = 1; loopCount <= 3; loopCount++)
    do
        n = 2 * n;
    while (n <= 4);
cout << n << endl;
```

a. 4
b. 8
c. 16
d. 32
e. 64

52. _____ Given the declarations

```
enum Days {YESTERDAY, TODAY, TOMORROW};
Days day = TODAY;
```

what is the value of the expression `int(day)` ?

a. `TODAY`
b. 1
c. `TOMORROW`
d. 2
e. none of the above

53. (4 points) Use correct C++ syntax to define a new type called player_t that consists of an integer called assists, an integer called points, an integer called blocks, and an integer called rebounds.

54. (10 points) Write a value-returning function named Array_Min that returns the smallest value found in a one-dimensional integer array. The parameters are the array and its size.

55. (12 points) Given the following program segment, what is the output of each `cout` statement?

```
double x[5];
int y;

for (y = 0; y < 5; y++)
    x[y] = 2 * y - 1;
y = 2;
```

a) `cout <<  x[4] << endl ;` _____

b) `cout << x[0] << endl;` _____

c) `cout << x[1] + 2.0 << endl;` _____

d) `cout << x[(1+1)*2] << endl;` _____

e) `cout << x[int(x[2])] << endl ;` _____

f) `cout << x[y++] << endl;` _____

56. (5 points) Using the data values

```
3 2 4
```

show what is printed by the following program.

```
#include <iostream>
using namespace std;
void Test(int&, int&, int);
int main()
{
   int a = 15;
   int b = 5;
   int c = 12;
   Test(a, b, c);
   b = b + 10;
   cout << "The answers are " << b << ' ' << c << ' ' << a;
   return 0;
}
void Test(int& z, int& x, int a)
{
   cin >> z >> x >> a;
   a = z * x + a;
}
```

57. (5 points) What is the output of the following program segment? (All variables are of type `int`.)

```
i = 1;
while (i <= 5)
{
   sum = 0;
   j = 1;
   while (j <= i)
   {
      sum = sum + 3*j;
      j++;
   }
   cout << sum << ' ';
   i++;
}
```

58. (12 points) a. (8 points) Write a value-returning function named Count_Lines which takes a file stream as input and returns the number of lines in the file. You know you have come to the end of a file when you see a newline character. b. (4 points) Show all the necessary declarations and the calling statement in the calling function for the user function in question 58a.