True or False – (12 Points)

1. (12 pts) Circle T for true and F for false:

   T   F   a) A struct declaration ends with a semicolon.
   T   F   b) Static variables retain their value from function call to function call.
   T   F   c) Local variables cannot be accessed outside of the block in which they are declared.
   T   F   d) Arguments corresponding to reference parameters can be literal values.
   T   F   e) Global identifiers have name precedence over local identifiers.
   T   F   f) void functions can use the statement return;

   T   F   g) Members of a structure must have unique names.
   T   F   h) Members of a structure can be of different DataTypes.
   T   F   i) A union variable contains only information for one of its members at any given time

   T   F   j) The lifetime of a local variable is for the duration of the program.
   T   F   j) Static variables in a function are deleted when the function finishes execution.
   T   F   j) A loop that executes a specified number of times is called a count-controlled loop.

Multiple choice (12 points) – Questions 2 – 13

For these problems circle all correct answers.
For example if answers A, C and E are all valid then circle A, C and E.

2. How many function values does a void function have?

   A) 0       B) 2       C) As many as necessary
   D) 1       E) 3       F) None of these
3. Which operations below ARE ALLOWABLE aggregate operations on structures?
   A) Arithmetic  B) Comparison  C) Assignment
   D) Return as a functions return value  E) Input/Output

4. A function SomeFunc has two parameters, alpha and beta, of data type int.
   The data flow for alpha is one-way, out of 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? (One answer only)
   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 )
   E) None of the above

5. Value parameters (passing by value) are used if a parameters data flow is:
   A) Two-way, into and out of the function
   B) One-way, into the function
   C) One-way, out of the function
   D) A and B
   E) B and C

6. Reference parameters (passing by reference) are used if a parameters 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
   E) B and C
   F) None of these

7. Which parameters in the following function heading are value parameters?
   void DoSomething(string& date, int num, float average, float sum, string& name)
   A) date  B) num  C) average  D) sum  E) name  F) None of them

8. Which parameters in the following function heading are reference parameters?
   void DoSomething(string  date, int& num, float average, float& sum, string name)
   A) date  B) num  C) average  D) sum  E) name  F) None of them
9. (2 pts) A function that \textit{returns a function value} is known as what kind of function?

A) Expression less  
B) Void  
C) Empty  
D) Reference Parameter  
E) Value returning  
F) None of these  

10. The \texttt{void} function named \texttt{GetNums} has two parameters:
A pass-by-reference parameter named \texttt{x} of type \texttt{float}
A pass-by-value parameter named \texttt{num} of type \texttt{int}.

Which of the following choices is the most appropriate \textit{function heading} for the function \texttt{GetNums}? (There is only one answer on this problem)

A) \texttt{void GetNums( float x , int& num )}  
B) \texttt{void GetNums( float& x , int num )}  
C) \texttt{void GetNums( float x , int num )}  
D) \texttt{void GetNums( float& x , int& num )}  
E) None of the above  

11. The \texttt{void} function named \texttt{GetNums} has two parameters:
\hspace{1cm} a pass-by-reference parameter named \texttt{x} of type \texttt{float}  
\hspace{1cm} a pass-by-value parameter named \texttt{num} of type \texttt{int}.

Which of the following choices is a valid \textit{function prototype} for the function \texttt{GetNums}?  

A) \texttt{void GetNums( float& , int );}  
B) \texttt{void GetNums( float& x , int& num );}  
C) \texttt{void GetNums( float& x , int num );}  
D) Both A and C  
E) Both B and C  
F) None of the above  

12. An individual pass through, or repetition of, the body of a loop is called a(n) \textit{????}.  

A) Loop test  
B) Priming read  
C) Termination condition  
D) Iteration  
E) None of the above  

13. A variable that is incremented each time a particular event occurs is called a(n) \textit{????}.  

A) Loop control expression  
B) Iteration counter  
C) Sentinel value  
D) Event counter  
E) None of the above
14. (6 pts) Given the following constant and variable definitions/declarations

```c
const int MAX = 100;
int sum;
float average;
string name;
void square(int); // function prototype
```

and the following list of expressions to be used as **arguments in a function call**:

a) MAX*2  
b) sum-25  
c) “Hello”  
d) average  
e) square(sum)  
f) 2  
g) sum  
h) name+”—“

A) **Which expressions listed above are valid for use as function call arguments passed to value parameters?**

B) **Which expressions listed above are valid for use as function call arguments passed to reference parameters?**

15. (6 pts) **There are three functions shown in the code segment below. Assume all variables and function prototypes have been correctly declared before this segment of code.**

```c
Average(sum, num, average);
status = PrintInfo(inFile, myResult, MyCalc(num));
```

A) **Which function(s) is(are) most likely value-returning function(s)?**

B) **Which function(s) is(are) most likely void function(s)?**

C) **What are the arguments that are used in the function calls.**
16. (8 pts) When the program shown below is executed, what is the output to the screen? This problem deals with the scope of a variable in a program, and the order of execution of statements.

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

void function_A(int&);
void function_B(int&);
int number = 2;  // global variable declaration of number
int main()
{
    int number = 4;
    function_B(number);
    function_A(number);
    cout << "number in main is: " << number << endl;
    return 0;
}

void function_A(int& number)
{
    number = number + 2;
    cout << "number in function A is: " << number << endl;
}

void function_B(int& sum)
{
    sum = sum - 1;
    cout << "number in function B is: " << number << endl;
    cout << "sum in function B is: " << sum << endl;
}
```

The identifying phrases written by the cout statements in this program are shown below. In the blank to the left of the lines, place 1, 2, 3 or 4 to indicate the order the statements are printed (1 for first, 4 for last). The value output is placed in the blank at the end of the line.

___ number in main is: _____
___ number in function A is: _____
___ number in function B is: _____
___ sum in function B is: _____
17. (4 pts) Consider the following structure declaration when answering the questions below.

```c
struct Cars
{
    string maker;
    string model;
    int year;
    string color;
};
```

a) Write a statement that declares the identifier `car` as a variable of DataType `Cars`.

b) Write a `cout` statement that will output the value of the member `year` of the variable `car`.

c) Write a `cout` statement that will output the value of the member `maker` of the variable `car`.

d) Write a statement that assigns a value of “Black” to the `color` member of `car`.

18. (4 pts) Write the type declaration for a struct DataType named `House` containing the following members:

- an **integer variable** representing the year a house was built
- a **string variable** representing the type of house
- a **floating-point variable** indicating the cost of the house
- an **integer variable** representing the number of bedrooms
19. (4 pts) Consider the following function definition:

```c
void Square( int& x)
{
    x = x * x;
    return x;
}
```

Assuming an appropriate prototype has been included previously, will the function `Square` above compile correctly? (circle yes or no)  

Yes      No

If your answer was no, explain why it will not compile.

20. (8 pts) Rewrite the value returning function definition below as a void function definition such that the caller of the function still has access to the sub-string that is being returned by the value returning function. Be sure to change the function return type from string to void and to add in a parameter that returns the sub-string obtained.

```c
string FindSubstring()
{
    string substring, line;
    cout << "Enter a line: ";
    getline(cin, line);
    substring = line.substr(line.size()/2, line.size());
    return substring;
}
```
21. (8 pts) For the following code segment, write out what is printed to the screen. Show the displayed output precisely by using the following rules:

- Write one character per box.
- Skip a box to indicate the presence of a blank space in the output.
- Skip a row to indicate the presence of a blank line in the output.

```cpp
#include <iostream>
using namespace std;
void Test();
int main()
{
    int count = 0;
    while (count < 5)
    {
        cout << count << "-"; // note no line termination
        Test();
        count++;
    }
    return 0;
}
void Test()
{
    int i = 0;
    static int j = 5;

    j--;
    cout << i << "-" << j << endl;
    i= i + 2;
}
```
22. (8 pts) Finish the code segment below by using a while loop so that the following action is performed:
   a) Prompt the user for the name of an input file and read it.
   b) Open the file.
   c) If the file did not open successfully, print out a message stating as such, reset the input stream variable (code to do this is `inFile.clear();`)
   d) Repeat steps a,b,c until a file is successfully opened or the user enters ctrl-c.

```cpp
ifstream inFile;
string filename;
cout << "Enter the name of the input file(or ctrl-c to exit):"; cin >> filename;
inFile.open(filename.c_str());
// rest of the code segment goes below this line
```
23. (10 pts) For the questions A through F, consider the following program. Note just the lines of importance have been displayed here. There is at least one answer for each question, and some may have more than one answer. Provide ALL the answers to a question. As an example, if the question is “what line contains a return statement?” The answer is line 12, 14 and line 16.

#include <iostream>  // Line 1
using namespace std;  // Line 2
int function_1(int&, float, int);  // Line 3
void function_2(float&, int, float&); // Line 4
void function_3();  // Line 5
int main()  // Line 6
{
    int sum1, num, enter;  // Line 7
    float temp, avg;  // Line 8
    function_3();  // Line 9
    function_2(avg,num,temp);  // Line 10
    function_2(avg,function_1(sum1,avg,num),temp);  // Line 11
    return 0;  // Line 12
}

int function_1(int& sum, float number, int enter) // Line 13
{
    return enter; // Line 14
}

void function_2(float& average, int count, float& number)  // Line 15
{
    return; // Line 16
}

void function_3()  // Line 17
{
    return; // Line 18
}

A) Which of the lines indicated are function prototypes? _______________________________________

B) Which of the lines indicated include function calls? _______________________________________

C) Which lines are the start of a function definition? _______________________________________

D) What are the arguments used in the function call for function_1? _______________________________________

E) What are the parameters of function_1? _______________________________________

F) Which parameter(s) of function_2 are value parameters? _______________________________________

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24. (10 pts) Add a function prototype, function call statement and function definition to complete the following program.

- The name of the value-returning function is Average.
- The function has two parameters of data type float.
- The function is to divide the first parameter by the second parameter and return the result.

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

// Place the function prototype for Average below this line

int main()
{
    float avg;
    float sum = 225;
    float num = 10;

    // Place the function call statement for Average below this comment
    // Use sum as the first argument and num as the second argument. Store the return value in the variable avg

    cout << "Average: " << avg << endl;
    return 0;
}
// Place the function definition for Average below this line
```
Extra Credit #1)
The following two bonus questions are for students present in class the day the code was given.

Possible answers for the 2 questions are:

A) CPE112  B) CPE212  C) CPE  D) EE
E) ABC456  F) LMN123  G) 456ABC  H) 123LMN
I) RAIN  J) SNOW  K) FOG  L) SLEET

Bonus #1 (+2 pts) Code #1 for Test3 is _______________________

Bonus #2 (+2 pts) Code #2 for Test3 is _______________________

Extra Credit #2 (5 pts) The following program is executed. What is the output to the screen?

```cpp
int count = 10;
bool finished = false;
while (!finished)
{
    cout << count << endl;   // executes with each loop iteration
    count-- ;
    if (count >= 0)
        finished = false;
    else
        finished = true;
    count--;
}
// output when loop exits
cout << "count is: " << count << endl;
```