True or False – (14 Points)

1. (14 pts) Circle T for true and F for false:

   a) In C++, a function definition should not be nested within another function definition.

   b) Static variables retain their value from function call to function call.

   c) The use of the statement: `return;` is valid in a value returning function.

   d) Arguments corresponding to value parameters can be literal values.

   e) Value parameters receive a copy of an arguments value.

   f) Arguments corresponding to reference parameters can be literal values.

   g) Members of a structure must have unique names.

   h) Members of a structure must all be of the same DataType.

   i) The expression `first.name` could be used to access the name member of a structure variable `first`.

   j) Hierarchical structures are structures where at least one member is a structure.

   k) All members in a Union can hold a valid value at the same time.

   l) Void functions must use `return expression;` to transfer control back to the caller of the function.

   m) The lifetime of a local variable is from the point of declaration to the end of the block in which it is declared.

   n) Local identifiers have name precedence over global identifiers.
Multiple choice (8 points) – Questions 2 – 9
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 value-returning function have?
   A) 4  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) Return as a functions return value  B) Arithmetic  C) Input/Output
   D) Pass by value in a function call  E) Assignment  F) Comparison

4. A function that does not return a function value is known as what kind of function?
   A) Value returning function  B) Reference Parameter  C) Empty
   D) Void function  E) Expression less  F) None of these

5. 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 C
   E) B and C
   F) None of these

6. What are the reference parameters in the following function heading?
   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

7. What are the value parameters in the following function heading?
   void DoSomething(string year, int value, float avg, float per, string city)
   A) year  B) value  C) avg  D) per  E) city  F) None of them
8. The **void** function named **GetNums** has two parameters

A **pass-by-reference** parameter named **x** of type **float**
A **pass-by-value** parameter named **num** of type **int**.

Which of the following choices is a valid **function prototype** given the description of the parameters for the function **GetNums**?

A) `void GetNums( float& , int );`
B) `void GetNums( float , int& );`
C) `void GetNums( float , int );`
D) `void GetNums( float , int& );`
E) `none of the above`

9. The **void** function named **GetNums** has two parameters

A **pass-by-reference** parameter named **x** of type **float**
A **pass-by-value** parameter named **num** of type **int**.

Which of the following choices is a valid **function heading** given the description of the parameters for the function **GetNums**?

A) `void GetNums( float& x, int )`
B) `void GetNums( float , int& num )`
C) `void GetNums( float& x, int num )`
D) `A, B and C`
E) `none of the above`

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**Short Answer (78 points) – Questions 10 – 19**

10. **(4 pts)** Write a **structure declaration** for a structure named **Car** containing the following members:

- an **integer variable** representing the number of doors
- a **string variable** representing the maker of the car
- a **string variable** representing the model of the car
- a **string variable** representing the color of the car
11. (10 pts) Consider the following structure declarations when answering the questions below.

```c
struct Date {
    int day;
    int month;
    int year;
};
struct Customer {
    string item;
    string custName;
    Date purchDate;
};
```

a) Write a statement that declares the identifier `birthday` as a variable of DataType `Date`.

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

c) Write a statement that declares the identifier `johnDoe` as a variable of DataType `Customer`.

d) Write a statement that assigns a value of “Coat” to the `item` member of `johnDoe`.

e) Write a `cout` statement that will output the value of the `year` member of the `purchDate` member of `johnDoe`.
12. (6 pts) Given the following constant and variable definitions/declarations.

```cpp
class string NAME = "Ron";
int value;
float sum;
string city;
void cube(int); // function prototype
```

consider the following list of possible expressions for use as arguments in a function call:

- a) NAME
- b) value
- c) city
- d) sum
- e) 13
- f) cube(value)
- g) "Ron"
- h) 'X'

A) List all expressions above that are valid for use as arguments with value parameters?

B) List all expressions above that are valid for use as arguments with reference parameters?

13. (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.

```cpp
status = Average(sum);
WriteInfo(outFile, Add(sum));
```

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?
14. (6 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 result (contained in the variable sub) that is being returned by the value returning function. (Hint: need to add a reference parameter for the void function)

```cpp
string FindSub(string line, string name) {
    string sub;
    sub = line.substr(line.find(name), line.size());
    return sub;
}
```

15. (6 pts) Rewrite the void function definition below as a value returning function definition such that the caller of the function still has access to the result that is being returned by the void function.
   - Do not use any reference parameters with the value returning function.
   - Use two parameters only with the value returning function only

```cpp
void Calculate (float& num1, float num2, float num3) {
    num3 = num2*num3;
    num1 = num2*num2 + num3;
}
```
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;
int main()
{
    int number = 4;
    function_B(number);
    cout << "number in main is: " << number << endl;
    return 0;
}
void function_A(int& num)
{
    int number = 1;
    num = num - 2;
    cout << "number in function A is: " << number << endl;
}
void function_B(int& sum)
{
    cout << "sum in function B is: " << sum << endl;
    function_A(sum);
    cout << "number in function B is: " << number << endl;
    sum = sum + 1;
}
```

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). In The blank at the end of the line, put in the output value.

___ number in main is: ___
___ number in function A is: ___
___ sum in function B is: ___
___ number in function B is: ___
17. (12 pts) Write a void function definition that counts the number of non-empty lines in an input file. The number of non-empty lines contained in the input file is returned to the caller using a reference parameter. This function requires two parameters – the input file stream and a line count.

- When an empty line is read with the getline function, the string variable holding the line read contains a null string (represented by """).
- The function assumes that the input file stream passed into the function is already open and associated with a file on the hard drive.

Write the function definition only. This is not a complete program.
18. (12 pts) Finish the program below by adding a void function as specified below. Add only a function prototype, function call statement and function definition to the following program.

The name of the void function is InitStruct.
The function has one parameter of the struct DataType Date.
The function is to initialize the structure parameter with a date of November 22, 2012.
The information stored in the structure must be available in main() after the function call.

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

struct Date
{
    string month;
    int day;
    int year;
};
// Place the function prototype below this line

int main()
{
    Date turkey;  // variable to hold the date of Thanksgiving
    // Place the function call statement below this line

    return 0;
} // Place the function definition below this line – write the definition
// This function initializes a structure variable
// with the date November 22, 2012
19. (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);
int main()
{
    Test(1);
    Test(2);

    Test(3);

    Test(2);
    Test(1);
    return 0;
}
void Test(int value)
{
    static int j = 0;

    cout << j << "-" << value << endl;

    j = j + value;
}
```
Extra Credit (5 pts)
For this problem show precisely the displayed output
   o Write one character per box.
   o Skip a box to indicate the presence of a blank space in the output.
   o Skip a row to indicate the presence of a blank line in the output.

What is the output for the following segment of code? All variables are integers

```cpp
for (int i = 0 ; i < 10; i++)
{
    if ( i > 4)
        continue;
    for (int j = i; j < 10; j++)
    {
        cout << j;    // output value of j
        if (j < 5)
            cout << "A";   // output of letter A
        else
            break;
    }
    cout << "-" << i << endl;  // output a dash and value of i
}
```