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 can be accessed outside of the block in which they are declared.
   T   F   d) Arguments corresponding to reference parameters must be variables.
   T   F   e) Global identifiers have name precedence over local identifiers.
   T   F   f) void functions can use the statement return 0;
   T   F   g) Member names within a structure must be unique.
   T   F   h) Members of a structure must all be the same DataType.
   T   F   i) A structure 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   k) Local variables in a function are deleted when the function finishes execution
   T   F   l) 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 value-returning 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) Input/Output           B) Assignment           C) Comparison
D) Return as a functions return value E) Arithmetic

4. 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? (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) 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) A 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) A and C

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& month, int& day, float cost, float pay, string year)

A) month    B) day    C) cost    D) pay    E) year    F) None of them
9. A function that 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 void function named GetNums has two parameters:
    A pass-by-value parameter named x of type float
    A pass-by-value parameter named num of type int.

Which of the following choices is the most appropriate function prototype for the function GetNums? (There is only one answer on this problem)

A) void GetNums( float, int& );
B) void GetNums( float&, int );
C) void GetNums( float, int );
D) void GetNums( float&, int& );

11. The void function named GetNums has two parameters:
    a pass-by-reference parameter named x of type float
    a pass-by-reference parameter named num of type int.

Which of the following choices is a valid function prototype for the function GetNums? (more than one answer is possible)

A) void GetNums( float&, int& );
B) void GetNums (float&, int);
C) void GetNums (float x , int& num );
D) void GetNums (float x , int num );

12. An individual pass through, or repetition of, the body of a loop is called a(n) __________.

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

13. In loops, a variable that is incremented each time a particular event occurs is called __________.

A) A loop control expression  
B) An iteration counter  
C) A sentinel value  
D) An event counter  
E) None of the above
Short Answer (76 points) – Questions 14 – 23

14. (6 pts) There are four functions shown in the code segment below. Assume all variables and function prototypes have been correctly declared before this segment of code.

   PrintInfo(inFile, MyCalc(num));
   Average(SumUp(num), average);

   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?

15. (6 pts) Consider the following segment of code

   char ch;
   cin >> ch;
   switch (ch)
   {
      case ‘A’: cout << “A”; break;
      case ‘B’: cout << “B”; break;
      case ‘C’: cout << “C”; break;
      case ‘D’: cout << “D”; break;
      default: cout << “No Match”; }

   a) What is the output if the character entered is B?

   b) What is the output if the character entered is D?
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 = 3;
    cout << "number in main is: " << number << endl;
    function_B(number);
    function_A(number);
    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 << "sum in function B is: " << sum << endl;
    cout << "number in function B is: " << number << 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 University {
    string nickname; // nickname of the university
    int underGrads;  // number of undergraduate students
    int grads;       // number of graduate students
    int alumni;      // number of alumni
};
```

a) Write a statement that declares the identifier `UAH` as a structure variable of DataType `University`.

b) Write a `cout` statement that will output the value of the member `grads` of the structure variable `UAH`.

c) Write a `cout` statement that will output the value of the member `nickname` of the structure variable `UAH`.

d) Write a statement that assigns a value of “Chargers” to the `nickname` member of `UAH`.

18. (4 pts) Write the type declaration for a `struct` DataType named `Counters` containing the following members:
- an `integer variable` representing the number of letters
- an `integer variable` representing the number of digits
- an `integer variable` representing the number of lines
- a `string variable` indicating the name of the counter
19. (4 pts) Consider the following function definition:

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

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 `void function definition` below as a `value-returning function definition` such that the value returned by the void function is returned as the function value of the value returning function. The value returning function is to have one less parameter than that shown for the void function.

```c
void CalcAverage(float& average, int sum, int num)
{
    cout << "Sum: ";
    cin >> sum;
    cout << "Number: ";
    cin >> num;
    average = float(sum)/num;
}
```
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()
{
    Test();
    Test();
    Test();
    Test();
    return 0;
}
void Test()
{
    static int i = 0;
    static int j = 10;
    i = i + 2;
    j = j - 2;
    cout << i << "—" << j << endl;
}
```
22. (14 pts) Write a value returning function that is described below:

- The name of the value returning function is **OpenInput**.
- The function return value is the name of the file that is opened
- The function has one parameter – an input file stream.
- The function is to:
  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.
  e) Return the name of the file successfully opened
23. (14 pts) Consider the following function definition:

```c
int Difference(int num1, int num2)
{
    int value;
    value = num2 - num1;
    if (num1 > num2)
        value = num1 - num2;
    return value; // return the positive difference between the #'s
}
```

Write a complete program that (you do not have to rewrite the above function definition):
1) in main() prompts the user for two integers and places them in variables,
2) in main() calls the difference function using the two integers entered as arguments, and
3) in main() prints the two integers and the return value of the function.
4) Assume that the function definition is to appear below main.

NOTE: This is an entire program, so show all #include directives, function prototypes, variable declarations, etc. You do not have to rewrite the function definition.
Space for continuing with problem 24
Extra Credit (6 pts) The following program is executed. What is the output to the screen?

#include <iostream>
using namespace std;
int Sum(int&, int );
int main()
{
    int num = 5, sum = -1;
    sum = Sum(num,sum);
    cout << "num:" << num << " sum:" << sum << endl;
    return 0;
}
int Sum(int-& num, int sum)
{
    do
    {
        sum = sum + num;
        cout << "num:" << num << endl;
        num = num-1;
    } while(num >= 1);

    return sum;
}