True or False – (16 Points)

1. (16 pts) Circle T for true and F for false:

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

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

T F c) When a continue statement is executed, the outermost loop in which it appears is exited.

T F d) Arguments corresponding to reference parameters can be literal values.

T F e) Reference parameters receive a copy of an arguments value.

T F f) Value-returning functions must use the statement return expression; to transfer control back to the caller of the function.

T F g) Members of a structure must have unique names.

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

T F i) The expression name.title is used to access the title member of the structure variable name.

T F j) A break statement is optional in a switch statement.

T F k) The default switch label is required in a switch statement.

T F l) All possible values for the switch expression must be included among the case labels for a given switch statement.

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

T F n) Global identifiers have name precedence over local identifiers.

T F o) body of a do-while loop executes zero or more times.

T F p) A variable declared as a union can hold more than one valid value at any given time?
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) 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) Assignment  C) Input/Output
   D) Pass by reference in a function call  E) Arithmetic  F) Comparison

Problems 4-6: a C++ value-returning function named **SumOfSquares** will sum the squares of the integers from 1 through **N** inclusive and return the integer sum via the function value (i.e. return value type **int**). (Preconditions: **N** assigned a value and **N** $\geq 1$)

**N** will be an arbitrary value of type **int** supplied by the calling program via an argument.

4. Based on the description above, which of the following choices is the most appropriate **function prototype** for the function **SumOfSquares**?
   A) void SumOfSquares(int&, int);
   B) void SumOfSquares(int, int);
   C) int SumOfSquares(int&);
   D) int SumOfSquares(int);
   E) None of the above

5. Based on the description above, which of the following choices is the most appropriate **function call** for the function **SumOfSquares**? (Assume all variables are integers and **N** has a value $\geq 1$)
   A) SumOfSquares(N);
   B) SumOfSquares(25);
   C) sum = SumOfSquares(25);
   D) sum = SumOfSquares(N);
   E) None of the above

6. Based on the description above, which of the following choices is the most appropriate **function heading** for the function **SumOfSquares**?
   A) void SumOfSquares(int sum, int N);
   B) void SumOfSquares(int& sum, int N)
   C) int SumOfSquares(int N)
   D) int SumOfSquares(int& N);
   E) None of the above
7. **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 C  
   E) B and C  
   F) None of these

8. **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

9. What are the **value 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

10. What are the **reference 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

11. 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** for the description of the parameters for the function **GetNums**?

   A) void GetNums( float& , int )  
   B) void GetNums( float x , int num )  
   C) void GetNums( float x , int& num )  
   D) void GetNums( float , int& )  
   E) none of the above
12. Which of the following can be used as a switch expression? (Select all correct answers):

A) bool variable   B) double variable   C) integer variable
D) string constant  E) floating point variable  F) None of Them

13. What is the output of the following code segment if num has a value of 3? Assume all variables are integers.

```cpp
switch(num-1) {
    case 3: cout << "a"; break;
    case 2: cout << "b"; break;
    case 1: cout << "c"; break;
    default: cout << "end";
}
```

A) abcend   B) abc   C) bc   D) a
E) b   F) c   G) cend   H) None of these

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Short Answer (72 points) – Questions 14 – 23

14. (6 pts) When the following segment of code is executed, the standard input stream contains the numbers 1 3 4 6 7 9. What is the output when the code executes

- 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
int sum = 0;
int number = 0;
do {
    cin >> number;
    sum = sum + number;
    cout << sum << "-";  // note no line termination
} while (number < 9);
```
15. (6 pts) What is the output for the following segment of code? All variables are integers

- 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
int j = 0;
do
{
    if (j < 3)
    {
        j++;
        continue;
    }
    cout << j << "-";
    if (j > 7)
        break;
    j++;
}
```

16. (6 pts) Consider the following segment of code

```cpp
int number;
cout << "Enter an integer between 0 and 10: ";
cin >> number;
switch(number*2)
{
    case 2: cout << 'A';
    case 4: cout << 'B';
    case 6: cout << 'C';
    case 10: cout << 'X';
    case 14: cout << 'Y';
    case 18: cout << 'Z';
        break;
    default: cout << "Default" << endl;
}
```

a) What is the output if 3 is entered?

b) What is the output if 7 is entered?
17. (8 pts) Write a do-while loop segment of code that continues to prompt for and read a word until the user enters in EOF. When the loop exits, output the number of words that were entered (excluding the loop ending EOF). Declare any variables required.

18. (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 value that is being returned by the void function.

- Do not use any reference parameters with the value returning function.
- Two value parameters only are allowed for use with the value returning function.
- You can add a single variable declaration to the value returning function if necessary.

```c
void Calculate (float& result, float num1, float num2)
{
    result = (num1 + num2)*5;
}
```
19. (4 pts) Write the type declaration for a struct DataType named LogType containing the following members:
   - an integer variable representing the log entry number
   - a string variable representing the name of the person making the log entry
   - a floating-point variable indicating the cost of the entry
   - A Date variable indicating the day of the entry where Date is a structure already defined

20. (8 pts) Write a void function definition that counts the number of empty lines in an input file. The number of 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 "\n").
   - The function assumes that the input file stream passed into the function is already open and associated with a file on the hard drive.
21. (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. There will be a total of 4 lines written to the screen from this program. Analysis of this program requires some thought.

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

void function_A(int&);  
void function_B(int&);
int number = 4;
int main()
{
    int number = 3;
    function_B(number);
    cout << "number in main is: " << number << endl;
    return 0;
}

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

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

The output for this program is as indicated 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:____
22. (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 **MyDate.**
The function is to initialize the structure parameter with a date of January 1, 2000.
The information stored in the parameter **must be available in main()** after the function call.

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

struct MyDate
{
    int day;
    int year;
    string month;
};

// Place the function prototype below this line

int main()
{
    MyDate Day;

    // Place the function call statement below this line

    return 0;
}
// Place the function definition below this line
```
23. (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:
  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.

```
#include <iostream>
using namespace std;
void Test(int&);
int main()
{
    int num = 1;
    Test(num);
    Test(num);
    Test(num);
    Test(num);
    return 0;
}
void Test(int& value)
{
    static int j = 0;
    cout << j << "-" << value << endl;
    j = j + 2;
    value = value + 2;
}
```
What is the output of the following program?

```cpp
#include <iostream>
using namespace std;
void Sum(int , int& );
int main()
{
    int num = 5;
    int sum = -1;
    Sum(num, sum);
    cout<<"Sum of integers from 1 to "<<num<<" is: "<<sum<<endl;
    return 0;
}
void Sum(int& n, int& sum)
{
    do
    {
        sum = sum + n;
        n = n - 1;
    } while(n >= 1);
}
```

*Sum of integers from 1 to ____________ is: ______________*