Closed notes and book. If you have any questions ask them. Write clearly and make sure the case of a letter is clear (where applicable) since C++ is case sensitive.
There are no syntax errors on this exam. If you find one let me know.

You can assume that there is one space between words unless otherwise noted. If necessary, the □ symbol indicates a space, and it is used when two or more spaces are together.

For this test the two-character sequence \n is to be taken to mean the newline character.

**Definition Matching – (10 Points)**

1. (10 pts) Match the words with their definitions. Choose the **best definition** for each word.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
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<tr>
<td>Data Type</td>
<td>B) A statement that stores the value of an expression into a variable</td>
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<tr>
<td>Semantics</td>
<td>C) A Name associated with a function or data object and used to refer to that function or data object.</td>
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<tr>
<td>Literal Value</td>
<td>D) A location in memory, referenced by an identifier, that contains a data value that <strong>can be changed</strong>.</td>
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<tr>
<td>Function Call</td>
<td>E) A location in memory, referenced by an identifier, that contains a data value that <strong>cannot be changed</strong>.</td>
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<tr>
<td>Named Constant</td>
<td>F) The formal rules governing how valid instructions are written in a programming language.</td>
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<tr>
<td></td>
<td>G) The set of rules that determines the meaning of instructions written in a programming language.</td>
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<td></td>
<td>H) Any constant value written in a program.</td>
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<tr>
<td></td>
<td>J) A specific set of values along with a set of operations on those values</td>
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<tr>
<td></td>
<td>K) A statement that associates an identifier with a data object, a function or a data type</td>
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<td></td>
<td>L) The explicit conversion of a value from one data type to another.</td>
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<td></td>
<td>M) The mechanism that transfers control to a function</td>
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A) **Definition is not listed below** (This answer can be used more than once if necessary)

B) A statement that stores the value of an expression into a variable
C) A Name associated with a function or data object and used to refer to that function or data object.
D) A location in memory, referenced by an identifier, that contains a data value that can be changed
E) A location in memory, referenced by an identifier, that contains a data value that cannot be changed.

F) The formal rules governing how valid instructions are written in a programming language.
G) The set of rules that determines the meaning of instructions written in a programming language.
H) Any constant value written in a program.

J) A specific set of values along with a set of operations on those values
K) A statement that associates an identifier with a data object, a function or a data type
L) The explicit conversion of a value from one data type to another.
M) The mechanism that transfers control to a function
True or False – (8 Points)

1. True or False – (8 Points)

   a) The C++ compiler finds syntax errors in a program?
   T   F

   b) The function `start()` is required for every C++ program.
   T   F

   c) Type coercion is the implicit conversion of one data type to another.
   T   F

   d) A C++ program is written during the problem-solving phase of a program’s life.
   T   F

   e) A value-returning function can be invoked (called) within an expression.
   T   F

   f) Algorithms are a step-by-step procedure for solving a problem in a finite amount of time.
   T   F

   g) The size() function returns the number of characters contained in a string variable.
   T   F

   h) The find() function returns string::npos if it successfully finds its argument.
   T   F

Multiple choice (16 points) – Questions 3 – 18

6) For these problems circle all correct answers

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

3. Which of the following are valid identifiers in C++?
   A) A_B       B) A123%456       C) twoBits       D) House_       E) All are invalid

4. Which of the following are not valid identifiers in C++?
   A) _Avg       B) rADIUS       C) 2bits       D) my-name       E) All are valid

5. Which of the following header files is required for using `cin` and `cout`?
   A) iostream       B) outstream       C) fstream       D) iomanip
   E) None of the above

6. What is the name of the header file required for using `setw` and `setprecision`?
   A) iostream       B) manip       C) iomanip       D) string       E) cmath
7. Which output manipulator ensures a decimal point is output for all floating-point numbers?

A) `setw`  B) `showdecimal`  C) `showpoint`  D) `endl`

E) None of the above

8. Which output manipulator can be used to specify the output justification?

A) `setw`  B) `center`  C) `showpoint`  D) `endl`

E) None of the above

9. Which output manipulator specifies how many character positions the next data item should occupy when it is output?

A) `setw`  B) `center`  C) `showpoint`  D) `endl`

E) None of the above

For questions 10-12, consider the following C++ declarations. In the code, a □ indicates a space

```cpp
string str1 = "This □ Class □ is □ CPE112";
string str2 = "CPE112 □ is □ hard";
string str3;
string::size_type num, Position;
```

For the above declarations, answer the questions based on the program fragment shown.

10. What is the output of the following program fragment listed below? (a □ indicates a space)

```cpp
num = str2.length(); cout << num;
```

A) 13  B) 14  C) 15  D) 16  E) string::npos

11. What is the output of the following program fragment listed below? (a □ indicates a space)

```cpp
Position = str2.find("2") ; cout << Position;
```

A) 0  B) 1  C) 5  D) 6  E) string::npos

12. What is the output of the following program fragment listed below? (a □ indicates a space)

```cpp
str3 = str1.substr(10,4); cout << str3;
```

A) s□Class□is  B) □is□  C) □Class□is□  D) s□is

E) None of the above
13. After the following code segment executes, what value is stored in the variable `result`?:

```c
float result;
int num = 5;
result = num/4 + 1.5;
```

A) 2  B) 1  C) 2.75  D) 2.5  E) a runtime error  F) None of These

14. The following C++ statements are to be included in a program. What is the best correct data type needed for the variable `mystery`? (only one possible answer for this question)

```c
float radius = 5.0;
?? mystery;
mystery = "answer = int(2*3.14159*radius)";
```

A) float  B) string  C) int  D) char  E) None of these

15. The statement that associates an identifier with a Data Type is known as a(n)

A) Declaration Statement  B) Assignment Statement  C) Naming statement
D) Expression Statement  E) All of these  F) None of these

16. Which of the following are ways used to structure(arrange) statements in a program?

A) Compiling  B) Indexing  C) Execution  D) Coupling
E) Subprograms  F) Looping  G) Selection  H) Sequential

17. C++ is an example of a(n)

A) Meta Language  B) Machine language  C) Assembly Language
D) Low Level Language  E) High Level Language  F) None of These

18. A(n) _________________ is a function that returns a function value to its caller and is invoked within an expression.

A) Main Function  B) Value-returning function  C) Void Function
D) Subprogram  E) None of These
Unix Commands (6 points) – Questions 19 – 24

19. What Unix command is used to obtain the current working directory path (shows you which directory you are in)?

20. Give the Unix command to create the directory Programs.

21. Give the Unix command to delete the empty directory Programs.

22. Give the Unix command that is used to rename the file in.txt to in.txt.bk.

23. Give the Unix command to compile the C++ program Program_04.cpp and create an executable named Program_04?

24. What is the Unix command that is used to view the contents of a directory?

Short Answer (60 points) – Questions 25 – 35

25. (3 pts) Identifiers can consist of what types of characters (three distinct answers)?

26. (3 pts) An expression is an arrangement of ________________, ________________, and ________________ that can be evaluated to compute a value of a given type.

27. (2 pts) What are two methods used to indicate comments in a C++ program?
28. (6 pts) Show the output of each statement below. (output starts at the left side)
   Place a single character in each box. Skip a box to indicate a space.

   a) cout << setw(6) << right << “Hello” << setw(6) << left << “World” << “A”;

   b) cout << right << setw(6) << “Name” << setw(8) << right << “please”;

29. (8 pts) Assignment and declaration statements

   a) Provide a constant declaration for a char identifier of INIT with a value of ‘A’.

   b) Provide a double variable declaration for the identifier average.

   c) Write a statement that assigns ‘M’ to the char variable tree.

   d) Write a statement that assigns the value 212 to the int variable boil.

30. (4 pts) Write a valid C++ mathematical expression for the following algebraic expressions.

   a) \( \frac{5(a + b)}{a + b - d + e} \)

   b) \( \frac{(a + b)(d + e)}{f + g} \)
31. (6 pts) The input stream buffer contains the following characters (\n represents the new line character): A B C \n 2 3 D E F \n. What is the output to the terminal when the code segment below is executed? Place one character in each box. Hint: Some variables have their value changed as the input is read. A space indicates a space.

```cpp
int num1; char ch1, ch2;
cin >> ch1;
cin.ignore(200, '1');
cin >> num1;
cin.ignore(200, '
');
cin >> ch2 >> ch2;
cout << ch1 << "-" << num1 << "-" << ch2;
```

32. (8 pts) Evaluate the expressions shown given the following declarations. If the answer is a floating-point value, be sure to indicate as such by using a decimal point in the answer. Remember that evaluation proceeds from left to right following an order of precedence for the operations.

```cpp
int a = 4, b = 2, c = 4, d = 8;
float x = 4.0, z = 26.0;
```

A) \((4 \times 8)/6 + a/b\)  
B) \(d - (d+1)/b*b\)  
C) \(z/x + b\)  
D) \(7.0/a*x + c\)  

33. (4 pts) Write the output statement(s) (using cout) that prints the value in the `float` variable `money` in eight spaces (left justified) with two digits of decimal precision.
34. (8 pts) Show precisely the displayed output of the following cout statement.
- Write one character per box. A □ indicates a space.
- 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.

Example: Spot run.

cout << "This is\nThe first line."
<< endl;
cout << "\nthe next"
<< endl;
cout << setw(8) << "line is not"
<< endl;
cout << setw(6) << left << "this"
<< setw(8) << right << "one"
<< endl;

35. (6 pts) What is the output for the following segment of code? Place the answers in the spaces provided one character per box. A □ indicates a space.

```cpp
int num = 10;
cout << "num=\n" << num << endl;
num--;
cout << "num=\n" << num << endl;
--num;
cout << "num=\n" << num + num << endl;
```
36. (8 pts) Show PRECISELY the output for the following program. Place a single character in each box, skip a box to indicate a space, and skip a row to indicate a blank line. In the code a ☐ indicates a space.

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

int main()
{
    const float DEBT = 100.0;    // Original balance owed
    const float PMT = 20.0;      // amount of payment
    const float INT_RATE = 0.01;  // interest rate

    float charge;  // amount charged for interest on the balance
    float reduce;  // amount of payment that goes toward balance
    float remaining;  // remaining balance after payment

    charge = INT_RATE*DEBT;
    reduce = PMT - charge;
    remaining = DEBT - reduce;

    cout << fixed << showpoint << setprecision(2);
    cout << "Payment: " << PMT << endl;
    cout << "Charge: " << charge << endl;
    cout << "Balance: " << remaining << endl;
    return 0;
}
```

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Extra Credit #1 (2 pts)
a) Which of the following characters CAN be used as part of an identifier?

A) !  B) b  C) v  D) _  E) 9  
F) 4  G) *  H) L  I) %  J) None can be used

Extra Credit #2 (2 pts)
What is the output for the code segment below. Write one character in each block.

```cpp
string str1 = "This-string-is-for-testing";
string str2;
string::size_type len=8;

str2 = str1.substr(str1.find("ring"),len);
cout << "S-" << setw(12) << left << str2 << "E" << endl;
```

Extra Credit #3 (2 pts)
What is the output for the code segment below. Fill in the blanks with the correct values.

```cpp
int num1, num2;
um1 = 11; num2 = 0;

num2 = num1 - num1%2*2;
cout << "num2_1 = " << num2 << endl;

num2 = num2 + num1/4;
cout << "num2_2 = " << num2 << endl;

num2 = num2%3 - num1%5;
cout << "num2_3 = " << num2 << endl;

num2_1 = ________________
num2_2 = ________________
num2_3 = ________________
```