CS 162-010 Exam I Spring 2022

Part I: True (T) / False (F), put T/F on the answer sheet (28 pts, 2 pts each)

1. Just like pointers, you can change what a C++ reference refers to at any time.

2. The size of a dynamic array is defined at compile time.

3. A segmentation fault may occur as a result of attempting to access an illegal memory location.

4. If a '**`*`**' is used in a declaration of a pointer variable, it is dereferencing that pointer variable.

5. The following code means the address of **`arr`** is assigned to **`ptr`**.
   ```
   int ptr = *arr;
   ```

6. A structure has member variables, like an object, but they are default to be public and accessed directly with the dot operator, instead of by calling member functions.

7. Anytime you have an array as a member of a class, you must create the Big Three for the class.

8. A destructor can have zero to many parameters.

9. A class declaration provides a pattern for creating objects, but it doesn't create any objects.

10. The implementation of the member functions cannot directly access the private section (i.e., by names) of the class.

11. Opening a file with the flag (mode) **`ios::app`** will preserve the contents of the file if the file already exists.

12. There are no default values for data members in a class, unless specifically provided.

13. In shallow copy, pointers and where the pointers are pointing to are duplicated.

14. Object-Oriented programming is centered around objects that include both data and the functions that operate on them.

Part II: Multiple Choices. Put your answers on the answer sheet (72 pts, 3 pts each)

1. The Big Three does NOT consist of which of the following?
   A. Copy Constructor
   B. Destructor
   C. Assignment Operator Overload
   D. Default constructor

2. A class containing an object of another class is useful for creating a _____ relationship between classes.
   A. has-a
   B. constant
   C. is-a
   D. friend

3. Which of the following statements correctly prints out the value stored in the memory address that the pointer **p1** is pointing to?
   A. **cout << &p1;**
   B. **cout << *p1;**
   C. **cout << p1;**
   D. **cout << .p1;**

4. Dynamic memory allocation occurs when _____.
   A. a new variable is created by the compiler
   B. a new variable is created at runtime
   C. a pointer is assigned an incorrect address
   D. a pointer failed to dereference the right variable

5. When an object or struct variable is passed to a function as a constant reference, _____.
   A. it is more efficient than passing it by value
   B. the function cannot make any changes to its member variables
   C. the function accesses the original object, rather than a copy of it
   D. all of the above

6. The assignment operator (=) can be used to:
   A. Copy data from one object to another
   B. Copy a class's member functions
   C. Compare two objects
   D. Test for equality

7. Given the class definition, which of the following is NOT legal?

```
class A {
public:
    A() {}
    A(int x, char y) : xx(x), yy(y) {}
    //other members
private:
    int xx;
    char yy;
};
```

   A. **A x(2, 'A');**
   B. **A x(2);**
   C. **A x = A(2, 'A');**
   D. **A x;**

8. The _____ is a special built-in pointer that is automatically passed as a hidden argument to all non-static member functions.
   A. overloaded = operator
   B. **`this`** pointer
   C. destructor pointer
   D. None of the above

9. If **`menu_button`** is an object of a class called **`button`** with a member function called **`get_color`** which has no parameters, a correct function call is:
   A. **`button.get_color`**
   B. **`menu_button.get_color()`**
   C. **`button.get_color()`**
   D. **`get_color()`**

10. We use header guards _____.
    A. to indicate that file is an interface file
    B. to create a header file
    C. to prevent multiple includes of an interface file
    D. to let the programmer know what file they are in

11. Which of the following data type can be used to create files and write information to them but cannot be used to read information from them?
    A. **`instream`**
    B. **`fstream`**
    C. **`ofstream`**
    D. **`ifstream`**

12. When a member function is defined outside of the class declaration, the function name must be qualified with the _____
    A. Class name, followed by a semicolon (;)
    B. Name of the first object
    C. Class name, followed by a scope resolution operator (::)
    D. Class name, followed by a colon (:)

13. A class is a(n) _____ that is defined by the programmer.
    A. variable
    B. data type
    C. function
    D. object

14. To know whether it is the end of a file, you use the function _____ .
    A. **`eof()`**
    B. **`clear()`**
    C. **`is_open()`**
    D. **`fail()`**

15. What will the following code output?

```
int number = 22;
int *var = &number;
cout << var << endl;
```

A. 22
B. The address of the **number** variable
C. An asterisk (*) followed by 22
D. Nothing, this code doesn't compile.

16. A(n) _____ is a special function that is called whenever a new object is created and initialized with data from another object of the same class.
A. assignment operator overload
B. copy constructor
C. destructor
D. default constructor

17. Analyze the following code:

```
class A {
public:
    int s;
    A (int newS) {
          s  = newS;
    }
    void print() {
         cout << s ;
    }
};

int main() {
       A a;
       a.print();
}
```

A. The program compiles and runs file and print nothing.
B. The program compiles and runs file and print a garbage value.
C. The program has a runtime error.
D. The program has a compiling error.

18. Given the statement, **`Circle *x;`**, which of the following statement is most accurate?
A. **`x`** is a pointer to a **`Circle`** object
B. You can assign an **`int`** value to **`x`** without any type casting
C. **`x`** contains an **`int`** value
D. **`x`** is an object of the **`Circle`** type

19. If **set_side** is a member function of the **Square** class and **box** is a **Square** object, which of the following statements would set the length of **box**'s side to 5?
    A. **Square.set_side = 5;**
    B. **box.set_side(5);**
    C. **set_side(5);**
    D. **Square.set_side(5);**

Consider the following code, and answer questions 20-22:

```
int main(int argc, char* argv[]) {
     int x = atoi(argv[1]), y = atoi(argv[2]);
     int **two_d_arr = new int*[x];
     for (int i = 0; i < x; i++){
          two_d_arr[i] = new int [y];
          for (int j = 0; j < y; j++)
               two_d_arr[i][j] = (i+1) * (j+1);
     }
     _____①_____ //free memory
     return 0;
}
```

20. Assuming row major, and the executable is **a.out**, how many rows and columns does **two_d_arr** have, if the program is run by the following command?
    ./a.out 3 4 5
    A. 4 rows, 3 columns
    B. 3 rows, 4 columns
    C. 4 rows, 5 columns
    D. 5 rows, 4 columns

21. According to the code above, which of the following is correct?
    A. The double pointer **two_d_arr**, the row pointers, and the columns are all on the stack.
    B. The double pointer **two_d_arr**, the row pointers, and the columns are all on the heap.
    C. The double pointer **two_d_arr** is on the stack, the row pointers, and the columns are on the heap.
    D. The double pointer **two_d_arr** and the row pointers are on the stack, and the columns are on the heap.

22. Which of the following does not give you a memory leak or segmentation fault at ①?
    A.
    ```
    delete [] two_d_arr;
    two_d_arr = NULL;
    ```
    B.
    ```
    delete [][] two_d_arr;
    two_d_arr = NULL;
    ```
    C.
    ```
    for (int i = 0; i < x; i++)
         delete [] two_d_arr[i];
    delete [] two_d_arr;
    two_d_arr = NULL;
    ```

D.
```
for (int i = 0; i < y; i++)
     delete [] two_d_arr[i];
delete [] two_d_arr;
two_d_arr = NULL;
```

Consider the following class declaration, and answer questions 23-24, and the extra credit question:

```
class Garage {
private:
   vehicle* cars;
   int num_cars;
   static string address;
public:
   Garage();
   ~Garage();
   void add_a_car(vehicle& car_to_add);
   Garage(const Garage&);
   Garage& operator=(const Garage&);
};

string Garage::address = "123 someroad";
```

23. Assume a program containing the class declaration defines three **`Garage`** objects with the following statement:
```
Garage one, two, three;
```

How many separate instances of the **`cars`**, **`num_cars`**, and **`address`** member exist, respectively?

A. 1, 1, 1
B. 3, 3, 3
C. 3, 3, 1
D. 1, 1, 3

24. Assume a program containing the class declaration does the following statement:
```
garage_object.add_a_car(some_car_object);
```

Which Big Three function will be invoked before the **`garage_object`** goes out of scope?

A. `Garage& operator=(const Garage&);`
B. `Garage(const Garage&);`
C. `~Garage();`
D. None

Extra Credit (5 pts):

1. Use the following options to complete the **`add_a_car()`** function, write letters (A-F) down:
   (Note: you have more options than needed)

```
void Garage::add_a_car(vehicle& car_to_add){




}
```

A. `num_cars++;`
B. `delete [] cars;`
C. `delete [] new_arr;`
D.
```
for (int i = 0; i < num_cars-1; i++)
      new_arr[i] = cars[i];

new_arr[num_cars-1] = car_to_add;
```
E. `vehicle * new_arr = new vehicle [++num_cars];`
F. `cars = new_arr;`
G. `new_arr = cars;`