2021Winter CIS200 – Programming Assignment 1
Class, Inheritance and UML

Professor: Jie Shen
Release date: Feb 1, 2021
Due date: Feb 14, 2021
Student name: Demetrius Johnson

Contents

Question 1 - Inheritance (30 points)

Source code (USED C++ COMPILER on Microsoft Windows 10)

See CPP and H uploads I made in canvas with this document along with the executables.

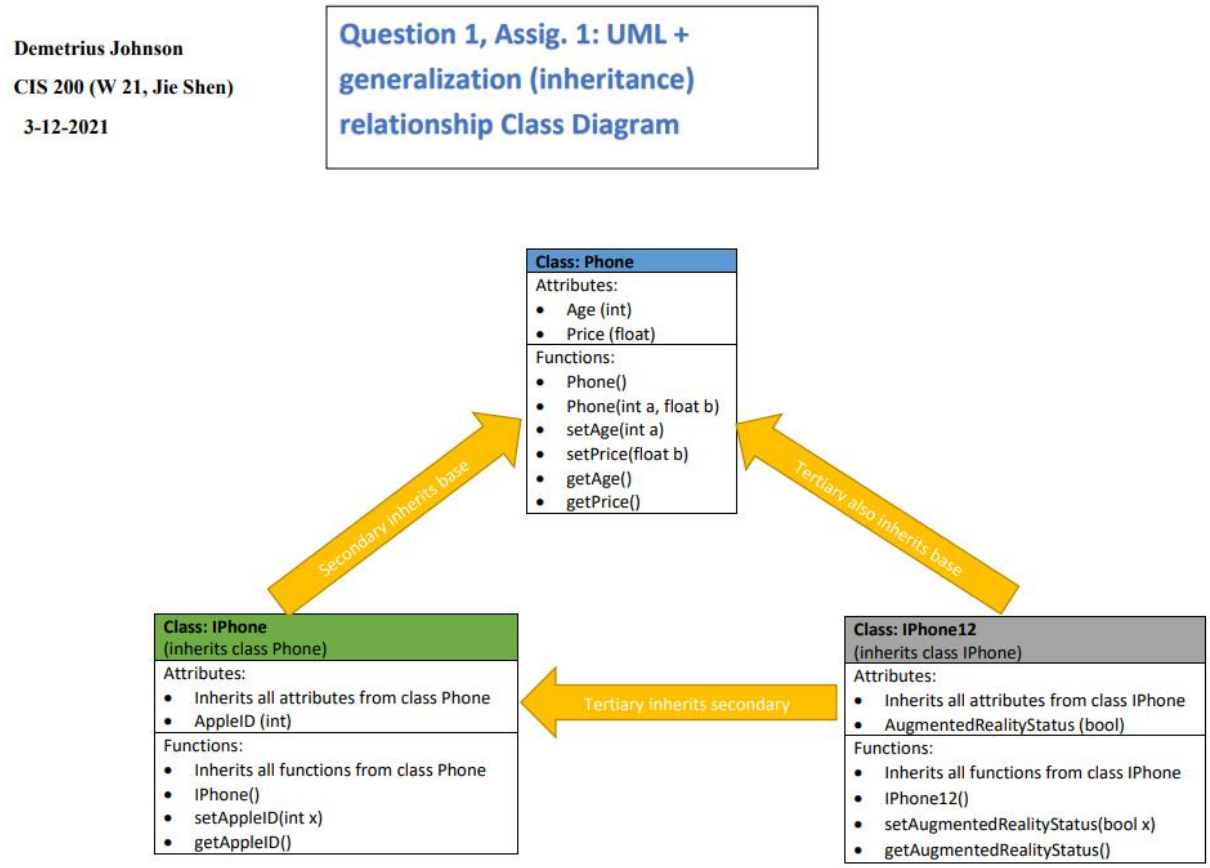
Test data and expected results

Test Table:

Test #	Valid / Invalid Data	Description of test	Input Value	Expected Output	Actual Output	Test Pass / Fail
1	valid	Used set and get functions for x	age = 3, price = 200	age = 3, price = 200	See screenshot	pass
2	valid	Used set and get functions for y	age = 2, price = 300, appleID = 1234	age = 2, price = 300, appleID = 1234	See screenshot	pass
3	valid	Used set and get functions for z	age = 1, price = 500, appleID = 3234 AugmentedRealityStatus = 1 (true)	age = 1, price = 500, appleID = 3234 AugmentedRealityStatus = 1 (true)	See screenshot	pass

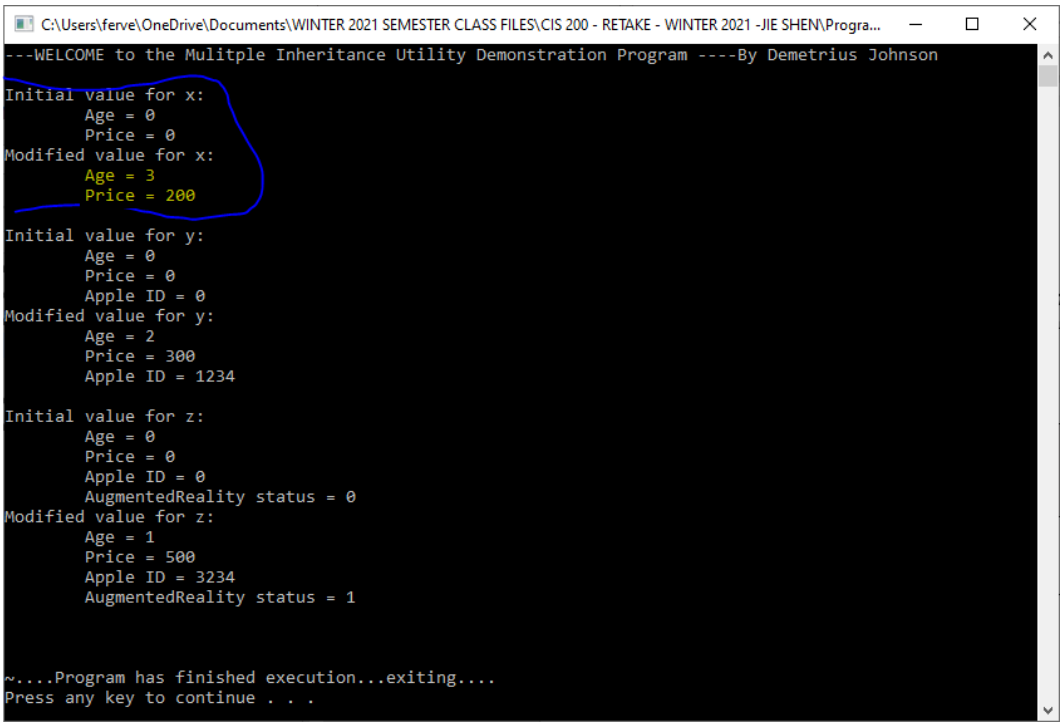
1) Draw three UML class diagrams, one for each of the classes mentioned above.
2) Draw a generalization among the three class diagrams, showing the inheritance relationship.

Note: for the above two parts I combined them into one diagram:

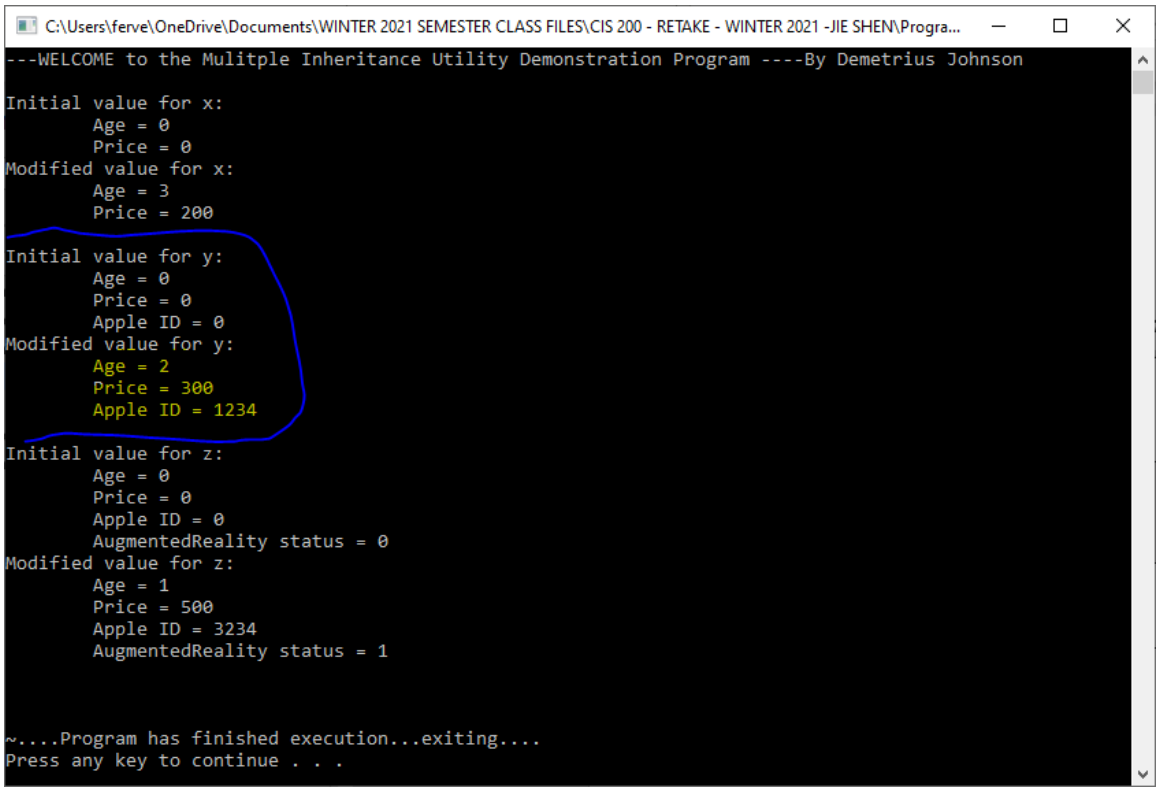


3) Implement the main driver function to test classes and test input:

TEST 1:


C:\Users\ferve\OneDrive\Documents\WINTER 2021 SEMESTER CLASS FILES\CIS 200 - RETAKE - WINTER 2021 -JIE SHEN\Progra...
---WELCOME to the Mulitple Inheritance Utility Demonstration Program ----By Demetrius Johnson
Initial value for x:
Age = 0
Price = 0
Modified value for x:
Age = 3
Price = 200
Initial value for y:
Age = 0
Price = 0
Apple ID = 0
Modified value for y:
Age = 2
Price = 300
Apple ID = 1234
Initial value for z:
Age = 0
Price = 0
Apple ID = 0
AugmentedReality status = 0
Modified value for z:
Age = 1
Price = 500
Apple ID = 3234
AugmentedReality status = 1
~....Program has finished execution...exiting....
Press any key to continue . . .

TEST 2: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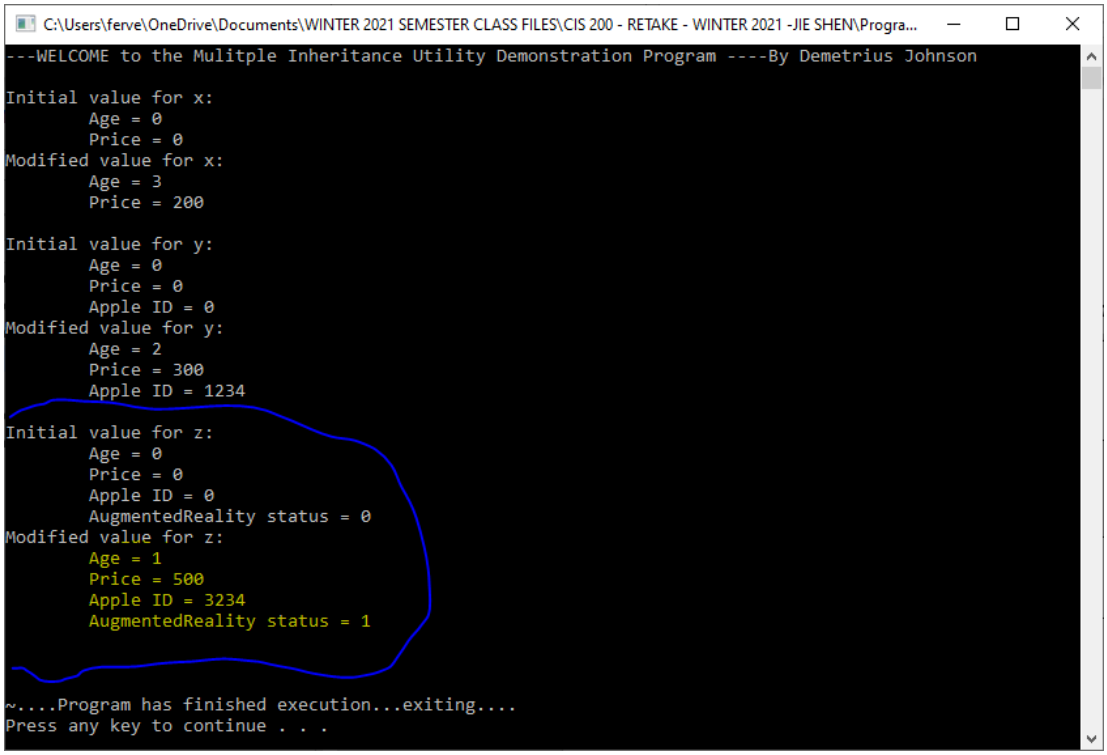
Initial value for x:
Age = 0
Price = 0
Modified value for x:
Age = 3
Price = 200
Initial value for y:
Age = 0
Price = 0
Apple ID = 0
Modified value for y:
Age = 2
Price = 300
Apple ID = 1234
Initial value for z:
Age = 0
Price = 0
Apple ID = 0
AugmentedReality status = 0
Modified value for z:
Age = 1
Price = 500
Apple ID = 3234
AugmentedReality status = 1
~....Program has finished execution...exiting....
Press any key to continue . . .

TEST 3: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Price = 300
Apple ID = 1234
Initial value for z:
Age = 0
Price = 0
Apple ID = 0
AugmentedReality status = 0
Modified value for z:
Age = 1
Price = 500
Apple ID = 3234
AugmentedReality status = 1
~....Program has finished execution...exiting....
Press any key to continue . . .

Question 2 - Class (30 points)

Source code (USED C++ COMPILER on Microsoft Windows 10)

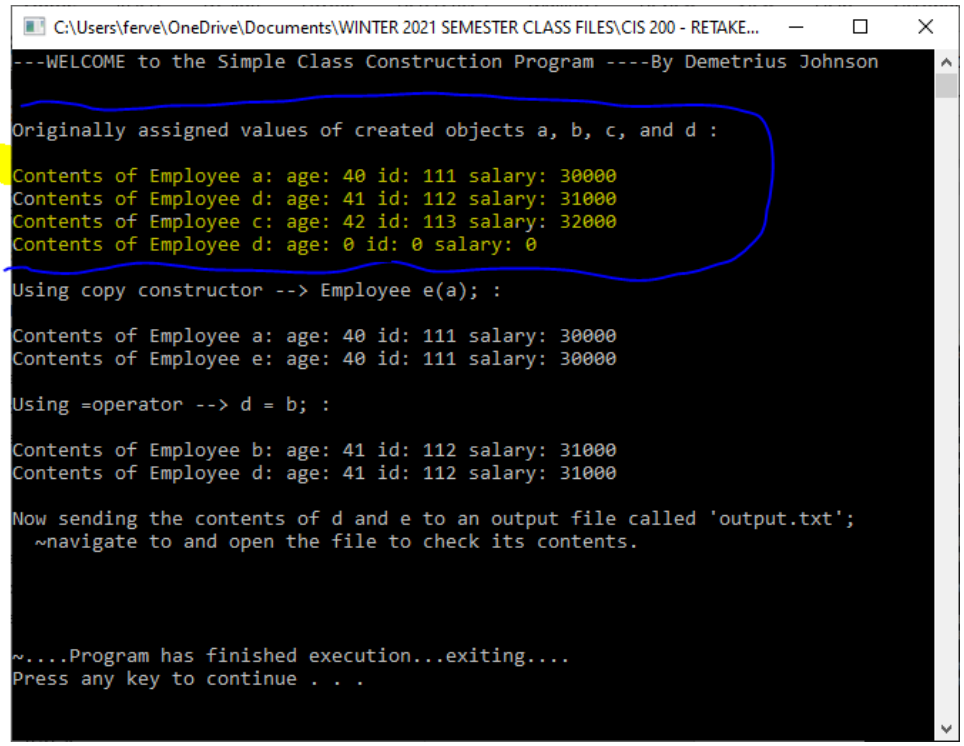
See CPP and H uploads I made in canvas with this document along with the executables.

Test data and expected results

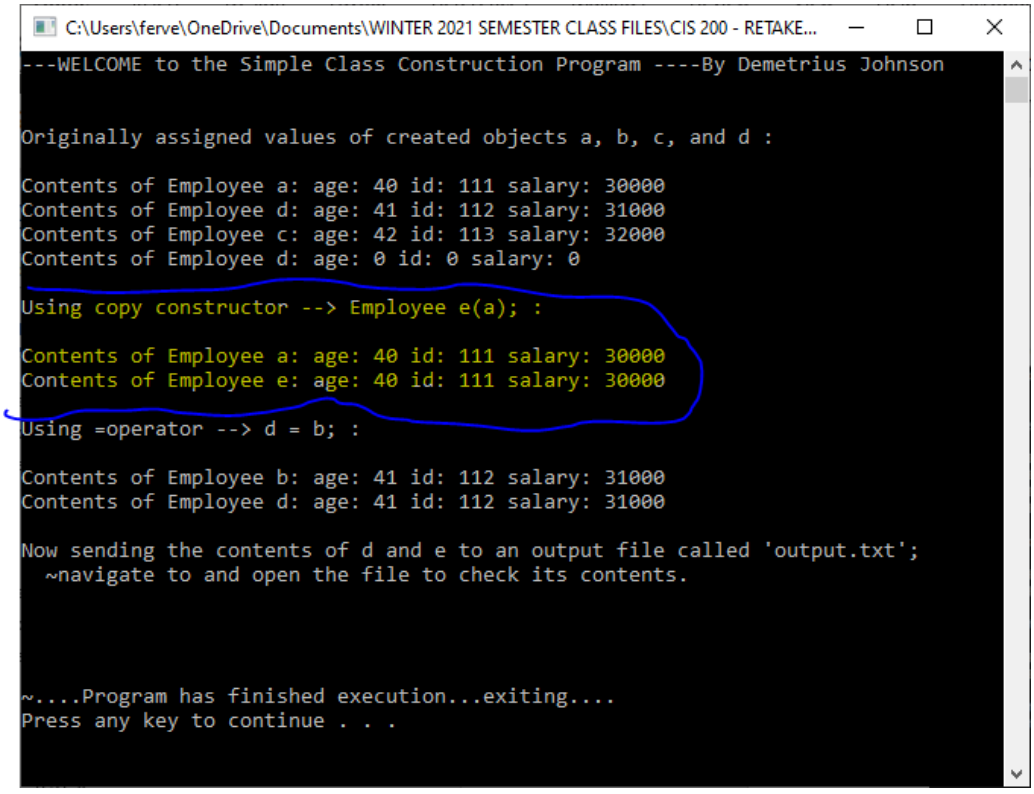
Test Table:

Test #	Valid / Invalid Data	Description of test	Input Value	Expected Output	Actual Output	Test Pass / Fail
1	valid	Original values of a, b, c, and d	Construct a-d obejects	See screenshot	See screenshot	pass
2	valid	Use copy constructor	Employee e(a);	See screenshot	See screenshot	pass
3	valid	Use assignment operator=	d = b;	See screenshot	See screenshot	pass
4	valid	Output contents of d and e to a file	Used print(ostream&) function	See screenshot	See screenshot	pass

TEST 1:


C:\Users\ferve\OneDrive\Documents\WINTER 2021 SEMESTER CLASS FILES\CIS 200 - RETAKE...
---WELCOME to the Simple Class Construction Program ----By Demetrius Johnson
Originally assigned values of created objects a, b, c, and d :
Contents of Employee a: age: 40 id: 111 salary: 30000
Contents of Employee d: age: 41 id: 112 salary: 31000
Contents of Employee c: age: 42 id: 113 salary: 32000
Contents of Employee d: age: 0 id: 0 salary: 0
Using copy constructor --> Employee e(a); :
Contents of Employee a: age: 40 id: 111 salary: 30000
Contents of Employee e: age: 40 id: 111 salary: 30000
Using =operator --> d = b; :
Contents of Employee b: age: 41 id: 112 salary: 31000
Contents of Employee d: age: 41 id: 112 salary: 31000
Now sending the contents of d and e to an output file called 'output.txt';
~navigate to and open the file to check its contents.
~....Program has finished execution...exiting....
Press any key to continue . . .

TEST 2: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Originally assigned values of created objects a, b, c, and d :
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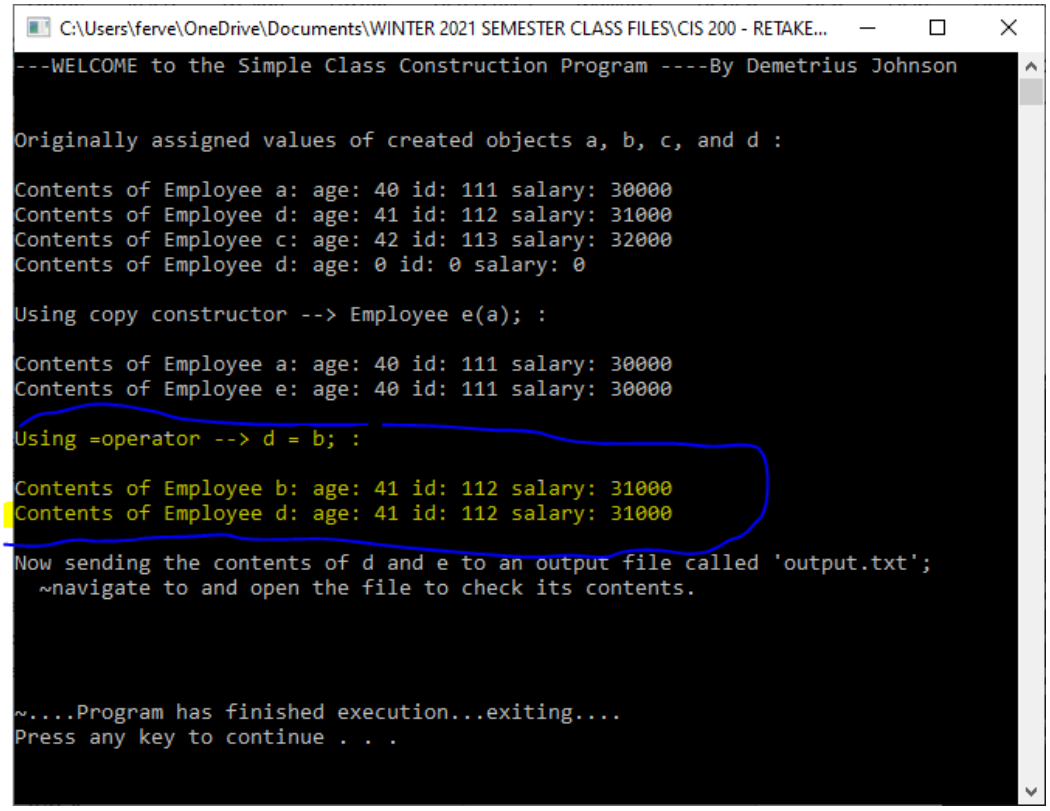
Contents of Employee d: age: 41 id: 112 salary: 31000
Contents of Employee c: age: 42 id: 113 salary: 32000
Contents of Employee d: age: 0 id: 0 salary: 0
Using copy constructor --> Employee e(a); :
Contents of Employee a: age: 40 id: 111 salary: 30000
Contents of Employee e: age: 40 id: 111 salary: 30000
Using =operator --> d = b; :
Contents of Employee b: age: 41 id: 112 salary: 31000
Contents of Employee d: age: 41 id: 112 salary: 31000
Now sending the contents of d and e to an output file called 'output.txt';
~navigate to and open the file to check its contents.
~....Program has finished execution...exiting....
Press any key to continue . . .

TEST 3: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Originally assigned values of created objects a, b, c, and d :
Contents of Employee a: age: 40 id: 111 salary: 30000
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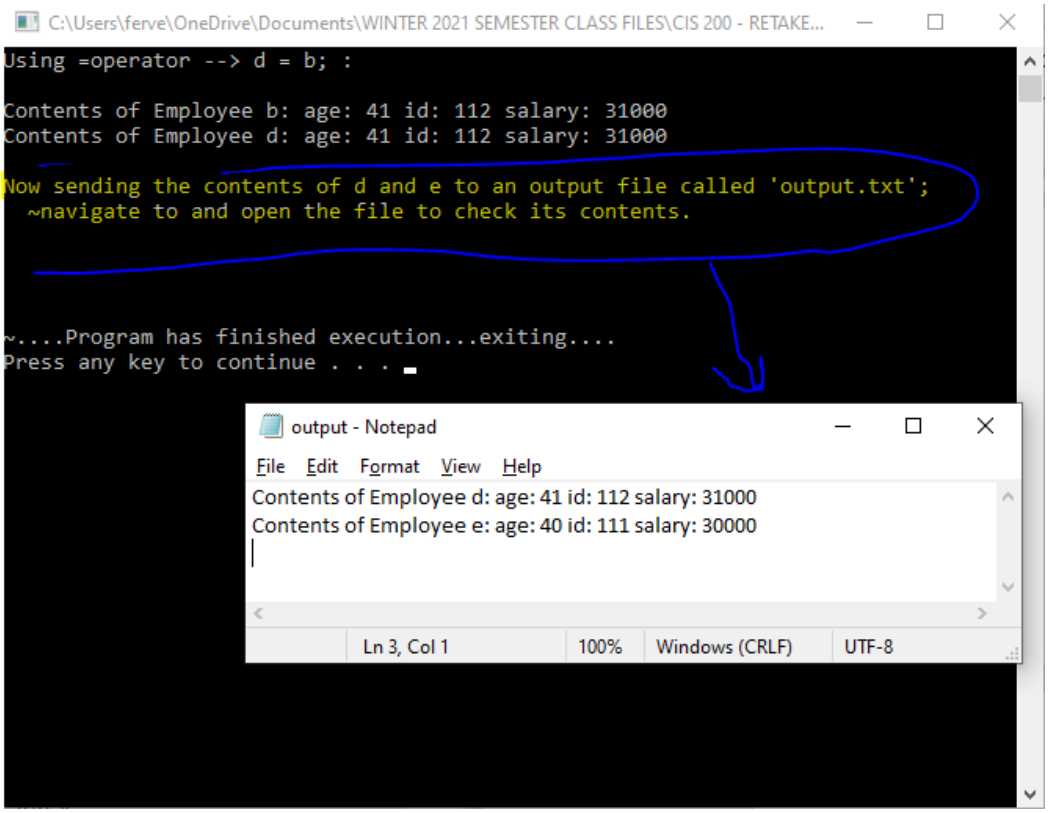
Contents of Employee d: age: 0 id: 0 salary: 0
Using copy constructor --> Employee e(a); :
Contents of Employee a: age: 40 id: 111 salary: 30000
Contents of Employee e: age: 40 id: 111 salary: 30000
Using =operator --> d = b; :
Contents of Employee b: age: 41 id: 112 salary: 31000
Contents of Employee d: age: 41 id: 112 salary: 31000
Now sending the contents of d and e to an output file called 'output.txt';
~navigate to and open the file to check its contents.
~....Program has finished execution...exiting....
Press any key to continue . . .

TEST 4:


C:\Users\ferve\OneDrive\Documents\WINTER 2021 SEMESTER CLASS FILES\CIS 200 - RETAKE...
Using =operator --> d = b; :
Contents of Employee b: age: 41 id: 112 salary: 31000
Contents of Employee d: age: 41 id: 112 salary: 31000
Now sending the contents of d and e to an output file called 'output.txt';
~navigate to and open the file to check its contents.
~....Program has finished execution...exiting....
Press any key to continue . . .
output - Notepad
File Edit Format View Help
Contents of Employee d: age: 41 id: 112 salary: 31000
Contents of Employee e: age: 40 id: 111 salary: 30000
Ln 3, Col 1
100%
Windows (CRLF)
UTF-8

Question 3 (15 points)

If we change our mind by using a struct to represent the information in Question 2, give the definition of a struct that you would like to use.

I would use a struct such as this, remembering that by default all members of a struct are public:

struct Employee{int age; int id; float salary;};
**I would not need any set or get functions since all of the members are accessible to all other functions. This would make programming question 2 a lot easier!*

Answer the following questions:

(1) Do we need a constructor or a destructor in a struct? Why?
We do not need a constructor or destructor since the struct would simply use non-pointer variables and will do just fine using the implicit default constructors and destructors.
(2) Do we need those get and set member functions in a struct? Why?
No; all member functions a struct is by default public (which are unlike classes that by default set all members private).
(3) Can we have a member function in a struct? Give an example.
Yes, we can have a member function in a struct. For example, you may have a print function that can output the contents of the struct to a file, or maybe you could have a reset function that will set all values in the struct to some default value through one function call.
(4) Between class and struct, which one is light-weighted (i.e., with less overhead)?
Struct definitely has less overhead as typically a struct is used so that a programmer does not have to write as many class functions, also because usually all members can be accessed directly and there is no need for as many functions with return values – return values come from functions whose local variables are placed on the stack, hence, there is overhead for the function call.

Question 4 (15 points)

Construct a Use Case Diagram of Student on the basis of the following specification:

Four Actors: Student, Registrar, Teacher and Financial Institution
Four Use Cases:

(1) Register a UM-D course: invoked by Student and handled by Registrar
(2) Drop a UM-D course: invoked by Student and handled by Registrar
(3) Attend a UM-D course: invoked by Student and taught by Teacher
(4) Obtain a student loan: invoked by Student and handled by Financial Institution

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CIS 200 (W 21, Jie Shen)

3-15-2021

Question 4, Assig. 1: Use Case Diagram of Student