

**NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES ISLAMABAD
CAMPUS**

**CS-1004 Object Oriented Programming Spring-2024
ASSIGNMENT-03**

Deadline: 23rd April, 2024

Instructions:

- 1) Please start early otherwise you will struggle with the assignment.
- 2) Assignments are to be done individually. The code you write must be your own and you must understand each part of your code.
- 3) You are encouraged to get help from your professors and teaching assistants via google classroom.
- 4) Marks are also allocated for good programming practices like indenting code, commenting, resource allocation (freeing dynamic memory) etc.
- 5) You can comment your name, Section, Roll number, Instructor and TA full name at the top of your main file for a possibility of bonus marks.
- 6) You are expected to follow CASCADE naming convention.
- 7) Marking will be based on viva and code review.
- 8) Your code must be in executable otherwise it will not be entertained.
- 9) Manipulation of code after submission will not be entertained.
- 10) Use of built-in libraries is not allowed. Usage will result in instant zero marks in the assignment.
- 11) Explanation of entire logic in comments is expected and required.
- 12) Plagiarism of any kind (copying from others, copying from the internet, etc) is not allowed. If found plagiarized, you will be awarded zero marks in the whole assignment category.
- 13) **Submission Guidelines:** Dear students, follow the given guidelines to the point.
 - a. Your folder should contain UML in PDF form .cpp and .h files.
 - b. Keep your code and PDF in separate folders.
 - c. Rename the folder as ROLL-NUM_SECTION (e.g. 23i-0001_A) and compress the folder as a zip file. (e.g. 23i-0001_A.zip). Only zip file will be acceptable.
 - d. Submit the zip file on google classroom. If we are unable to download your submission due to any reason, you will be awarded zero mark
 - e. Start the submission process well before time so that you can overcome problems as you face them.
 - f. You may use any online/offline tool for making your UML diagram.
 - g. It is encouraged to upload your code to your GitHub accounts and add your TA as collaborator.

Note: Follow the given instructions to the letter, failing to do so may result in a zero.

CASE STUDY

In this question, you need to write a host of classes, and place them in a reasonable hierarchy.

Description:

Design a class ALU which include the following attributes:

1. NoOfAdders: an integer
2. NoOfSubtractor: an integer
3. NoOfRegisters: an integer
4. sizeOfRegisters: an integer

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Design a class ControlUnit which includes the following:

1. clock: a float

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Design a class CPU which is composed of ALU and CU. Data members are:

1. alu: a ALU
2. cu: a ControlUnit

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

Intel/AMD CPUs or AppleSilicon is a CPU, with difference of architecture (x86 for Intel/AMD and AppleSilicon being ARM64). Furthermore, AppleSilicon will have an integrated GPU (AppleGPU)

Design a class MainMemory which includes the following:

1. capacity: an int
2. technologyType: a string (Possible values: Semiconductor, Silicon)

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Design a class Port which includes the following:

1. type: a string (Possible values: VGI Port,I/O Port,USB Port,HDMI Port etc)
2. baud_rate: an int

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

Design a class MotherBoard which is composed of Ports (IO ports, VGI ports etc) and aggregated with MainMemory:

1. mm: A MainMemory
2. ports: ports array

The class has the following member functions.

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Design a class PhysicalMemory which includes the following:

1. capacity: an int

The class has the following member functions.

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

DDR4/5 or LPDDR4/5 (LowPower DDR) is a PhysicalMemory. Intel and AMD systems use DDR4/5 while AppleSilicon based system use LPDDR4/5.

Design a class Computer which is aggregated of PhysicalMemory, CPU and MotherBoard, includes the following:

1. pm: A PhysicalMemory
2. mb: A MotherBoard
3. cpu: A CPU

The class has the following member functions.

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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GraphicsCard Class, with the following attributes:

1. brand: a string
2. memorySize: an int
3. price: a double

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

Nvidia, AMD or AppleGPU is a type of GPU. Nvidia and AMD GPUs are discrete, while AppleGPU is integrated in the CPU.

StorageDevice Class, with the following attributes:

1. type: a string (e.g., HDD, SSD)
2. capacity: an int
3. price: a double

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

Consumer HDD or NAS HDD is a type of HDD.

NetworkCard Class, with the following attributes:

1. type: a string (e.g., Ethernet, Wi-Fi)
2. speed: an int
3. price: a double

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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PowerSupply Class with the following attributes:

1. wattage: an int
2. efficiencyRating: a string (e.g., 80 Plus Bronze, 80 Plus Gold)
3. price: a double

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Battery Class with the following attributes:

1. capacity: an int

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
 2. A constructor initializing the attributes with Overloaded Constructors.
 3. Getters and Setters of the class data members.
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Case Class with the following attributes:

1. formFactor: a string (e.g., ATX, Micro ATX)
2. color: a string

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

Please note that a computer/PC case will have a price attached to it, while for laptops and tablets, there is no price for the case.

ComputerAssembly Class with the attributes based on the objects of the aforementioned classes, and additionally:

1. totalPrice: a double.

The class has the following member functions:

1. A constructor initializing the attributes with default parameters.
2. A constructor initializing the attributes with Overloaded Constructors.
3. Getters and Setters of the class data members.

*Note: PC and Macs are a type of ComputerAssembly in the context of this assignment. Hence, they will consist of the necessary correct components that are relevant to their type (e.g. Mac will have an AppleSilicon CPU, and not AMD CPU). **Hence, all components required to create a complete PC or Mac must be present.***

To check the scenario, *in the main function, create a new Computer Object (PC or Mac) by taking all necessary specifications from user.* In case of an incorrect input, your code must provide the error to the user and restart the process. Finally, you would need to display the specifications and the price of the computer.

Furthermore, provide a detailed UML diagram in the following manner:

1. The UML diagram must consist of all classes as used in your code.
2. Illustrate the relationships between classes (Composition, Aggregation or Inheritance).
3. In your UML diagram, the class names must correspond to the class names you have used in your code.
4. The attributes and methods names must also correspond to the same names as used in your classes.