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Object-Oriented Programming with Java

Midterm Exam, Dec.14th 2015

Student Name: _____

Please read each question carefully. The total points are 100. You have 180 minutes. Good Luck!

PART I – 70 POINTS

PART I – THEORY

EACH THEORY QUESTION IS WORTH 5 POINTS

1) Discuss pass-by-value and pass-by-reference.
2) Discuss the scope of local variables, instance variables and parameters.
3) What is the purpose of a static field? Give a short example with code.
4) Discuss method overloading.
5) In a non-static method, how can we access static members of the class?

PART I - EXERCISES

CREATE A PROJECT IN NETBEANS CALLED "STUDENT NAME SURNAME". DEVELOP ALL THE FOLLOWING PROGRAMS WITHIN THE SAME PROJECT.

1) Write e Java program that fills with random numbers an array of 100 elements and prints only those that are in even positions in the array. [15 points]
2) Write a Java program that takes from keyboard 10 numbers and sorts these numbers. Print the sorted sequence of numbers. [15 points]
3) Write a Java program that takes from keyboard an arbitrary number of strings decided from the user. After sorting the list the program prints only those that contain the substring "TEST". [15 points]

PART II – 15 POINTS

4) Write a program that fills with random numbers from 1 to 1000 a table 10x10 with values of type **double.** Then the program should print one diagonal (upper-left to bottom-right) of the table and all numbers in row 2 and 4. In addition, it should print all numbers of the table which are multiple of 5. [7.5 points]
5) Write a Java program that generates 100.000 random numbers from 1 to 100 and counts the frequency of each random number generated. Print these numbers together with the respective frequency. Find and print the numbers with the lowest frequency. [7.5 points]

PART III – 15 POINTS

6) Model the following in a Java program [15 points]:

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A computer manufacturing company needs to develop simple software for the assembly of a computer. The company wants to model these components of the computer: CPU, RAM, Hard Disk and Motherboard.

1. Represent these in a composition model considering that:

    a. The CPU has these properties: clock frequency (integer), instruction set type (ex. CISC or RISC), type (32 or 64 bit), number of registers, manufacturer (ex. AMD or INTEL).
    b. The RAM has these properties: size, type (DDR, DDR2 or DDR3), and manufacturer.
    c. Hard Disk has these properties: size, rpm (integer), and manufacturer.
    d. Motherboard has these properties: manufacturer, year of production, Chipset version, number of USB ports and max. RAM.

2. Write a class to test the program:

    a. Create 2 computers with the following features:

        First computer:
        CPU: 3 GHz, CISC, 32 bit, 64 registers, AMD
        RAM: 4 GB, DDR2, Producer Kingston
        Hard Disk: 500 GB, 7200 RPM, Maxtor
        Motherboard: AMD, 2011, Chipset AMD970, 6 USB ports, Max. 32 GB of RAM.

        Second computer:
        CPU: 4 GHz, CISC, 32 bit, 32 registers, INTEL
        RAM: 8 GB, DDR3, Producer Kingston
        Hard Disk: 1000 GB, 7200 RPM, Seagate
        Motherboard: MSI, 2011, Chipset Intel Z77, 6 USB ports, Max. 64 GB of RAM.

    b. Write a method through which we can change the CPU clock frequency of a computer. Use this method in your test program.
    c. Put the computers in one of the indexed data structures of Java that you have learned.
    d. Print the information of all the computers from the data structure using the toString( ) method.