kasneb

CICT PART II SECTION 4

OBJECT ORIENTED PROGRAMMING

THURSDAY: 30 November 2017.   **Time Allowed: 3 hours.**

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

ALL programs written should be in Java object oriented programming language.

QUESTION ONE
(a)   (i)   There are three steps involved when creating an object from a class.

           With the aid of an example, breakdown the steps in the order in which they occur.   (4 marks)

      (ii)   In relation to object oriented programming, compare and contrast an interface and a class.   (4 marks)

(b)   Using a call by value example, write a simple program that begins with a value of 50. After a change is made by adding a value of 100, it displays the sum of the two numbers.

The program should give an output as shown below:

```
Before change: 50
After change: 150
```

                                                                               (4 marks)

(c)   Write a program that calculates the arithmetic mean of numbers entered by a user. The program initially prompts the user: "How many numbers do you wish to enter?" After the user specifies how many numbers are to be entered, the program prints "Enter x numbers", where x represents the number the user specified earlier. The program then allows the user to enter the x numbers in turn, compute the arithmetic mean of the numbers and output. "Arithmetic mean = y", where y is the computed arithmetic mean.   (8 marks)
                                                             (Total: 20 marks)

QUESTION TWO
(a)   Write a Java program with a single class called "Dirisha" such that when Dirisha object is created, it draws a frame containing a button on the screen. When the button is clicked, the word "Dirisha" is printed on the standard output.
                                                                        (6 marks)

(b)   Explain two ways in which polymorphism could be implemented in Java programming.   (4 marks)

(c)   (i)   The Java API defines the following comparable interface:

```
interface Comparable {
    int CompareTo (object);
}
```

           Where x.CompareTo (y) should return −1 if x is less than y, 0 if x is equal to y, and 1 otherwise.

           Required:
           Define a class MyArray that implements "Comparable" and whose objects behave like integer arrays.

                                                                                 (6 marks)

(ii) Consider the following arrays:

```
int [ ] a = new int [ ] {1, 2, 3, 4};
int [ ] b = new int [ ] {-1, 2, -3, 4, -5};
```

Required:
Create two variables m_1 and m_2 of type MyArray and initialise them such that the elements of m_1 are those of a and the elements of m_2 are those of "b". (2 marks)

(iii) Write the expected output if the statement "system.out.println $(m_1$.compareTo $(m_2))$" was executed for the variables in (c) (ii) above. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) Outline four best practices in Java exception handling. (4 marks)

(b) Highlight four drawbacks of inheritance in Java programming. (4 marks)

(c) Outline three ways of copying the values of one object into another in Java. (3 marks)

(d) Mr. Jones is the owner of Heartland Cars International, a car dealership. Mr. Jones has three types of employees. In the case of full-time employees, Mr. Jones pays a base salary for first 80 hours of work and 100% of hourly rate for each additional hour. A part-time employee is paid per hour worked. Employees in sales are compensated by a base salary plus 1% of the total monthly sales amount. Mr. Jones pays his employees on alternate Fridays. Mr. Jones requires a Java program to help him prepare the payroll.

Required:
(i) Identify three classes for the payroll program. (3 marks)

(ii) Draw a class diagram with data members and methods for the payroll program. (6 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Distinguish between appending a string to a StringBuilder and concatenating two strings with a "+" operator. (4 marks)

(b) (i) Describe the term "visibility" as used in object oriented programming. (2 marks)

(ii) Using suitable Java code, demonstrate the use of different types of visibility. (4 marks)

(c) Distinguish between the object oriented programming principles of "interface" and "abstraction". (2 marks)

(d) Scanner is a predefined class used for reading dates dynamically from the keyboard in Java programming language.

Required:
Write Java statement(s) to:

(i) Import the scanner class. (1 mark)

(ii) Construct a scanner class object. (2 marks)

(iii) Read input from the keyboard for an integer data value. (1 mark)

(e) Describe the following types of relationships as used in Java programming:

(i) Is – A relationship. (2 marks)

(ii) Has – A relationship. (2 marks)

(Total: 20 marks)

QUESTION FIVE

(a) (i) Explain the meaning of the term "Java package". (2 marks)

(ii) Citing an example in each case, describe two types of Java packages. (4 marks)

(iii) Highlight two advantages of using packages in Java programs. (2 marks)

(b)   Write a simple Java program to calculate the area of a circle. The program should prompt the user to input the radius of the circle. Assume Pi = 3.142.   (4 marks)

(c)   Study the class diagram given below:
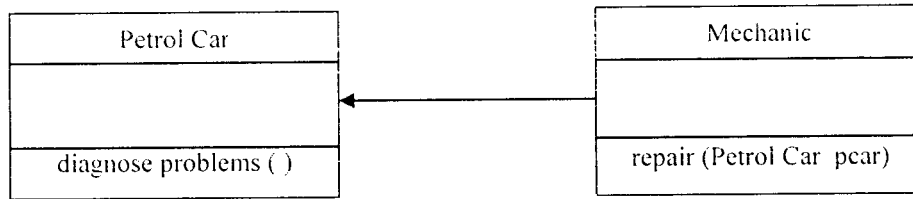
Required:

(i)   Adapt the diagram by adding a class for Diesel Cars in such a way that it can be used to illustrate polymorphism.   (4 marks)

(ii)   Add a fixEngine ( ) method that is overridden in Diesel Car but not overridden in Petrol Car.   (2 marks)

(iii)   If a Diesel Car object was passed to the repair ( ) method, identify the actual method that would be invoked by pcar.fixEngine ( ) method.   (2 marks)

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