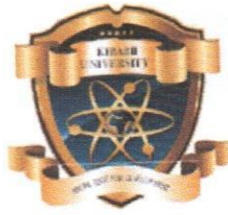


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*(KNOWLEDGE FOR DEVELOPMENT)*

**KIBABII UNIVERSITY  
(KIBU)**

**UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR**

**SPECIAL/SUPPLEMENTARY EXAMINATIONS  
FIRST YEAR SECOND SEMESTER**

**FOR THE DEGREE IN  
(INFORMATION TECHNOLOGY/ COMPUTER SCIENCE)**

**COURSE CODE: BIT 122/CSC 120**

**COURSE TITLE: OBJECT ORIENTED PROGRAMMING I**

**DATE: 10/02/2021**

**TIME: 11.00 A.M. - 1.00 P.M**

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**INSTRUCTIONS**

**ANSWER QUESTIONS ONE AND ANY OTHER TWO.**

### QUESTION ONE (COMPULSORY) [30 MARKS]

- a. Using relevant examples, define the following terms and concepts as used in study of OOP:
- i Object [2 marks]
  - ii Class [2 marks]
- b. Discuss the differences between procedures oriented programming and object oriented programming languages. [4 marks]
- c. Give a definition of a class structure in java. [2 marks]
- d. Using relevant java code differentiate between Accessor (getters) methods and mutator (setters) methods [4 marks]
- e. Write a java program that calculates and prints the product of three integers. [4 marks]
- f. (i) What is the output of the following code [2 marks]

```
char symbol[3]={'a','b','c'};
for (int index=0; index<3; index++)
    System.out.println( symbol [index]);
```

- g. If an array is declared as `int a[4] = {3, 0, 1, 2}`, then values assigned in `a[0]`, `a[4]` and `a[5]` will be \_\_\_\_\_. [2 marks]
- h. Given a class named Book with the variables: `char author` and `title` and `int yearOfPublication`, give the signatures of valid constructors. [2 marks]
- i. Create a class to represent a Circle. Your class should contain instance variables for the radius, a parameterized constructor, set and get methods for the radius, as well as member method to calculate the area of the circle. Include in your class the method `toString` that returns the string "Circle object" when called. [6 marks]

### QUESTION TWO [20 MARKS]

- a. Using a loop of your choice, write a java code segment that draws a triangle shown in Figure 1. [4 marks]

```
0  1  2  3  4  5
   1  2  3  4  5
    2  3  4  5
     3  4  5
      4  5
       5
```

Figure 1: Triangle of Digits

b. Figure 2 shows the structure of an array named marks in memory

45	78	72	71	57	70	58	80
34	56	76	24	54	75	49	64
60	64	65	42	63	73	80	67

Figure 2: Structure of an array in memory

Write a java code excerpt that will:

- i Create and initialize the structure as in figure 2 above. [3 marks]
- ii Compute Total and mean of each row and populate as new two columns on right-hand-side of the structure. [4 marks]
- iii Sort the marks in descending order. (Hint use the sort () method of function) [3 marks]

QUESTIONTHREE [20 MARKS]

- a. Differentiate between inheritance and composition. [4 marks]
- b. An organization has two types of employees: regular and adhoc. All Employees have a name, an employment\_Number and get salary. Regular employees get a salary which is basic\_salary + commuter\_allowance + house\_allowance, where commuter\_allowance is 10% of basic\_salary and house\_allowance is 30% of basic\_salary. Adhoc employees are daily wagers who get a salary which is equal to number\_of\_days \* Wage. The class hierarchy diagram is as in the Figure 3.

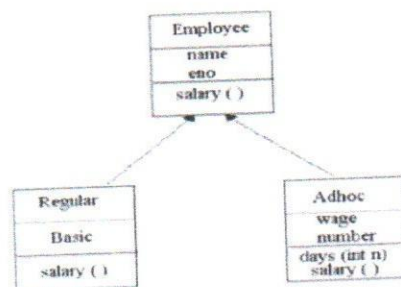


Figure 3: Employees class hierarchy diagram

- i. Give java definition of the classes shown in Figure 3 above. [6 marks]
- ii. Define the constructors such that when a regular employee is created, basic (basic\_salary) must be a parameter and when Adhoc employee is created, wage must be a parameter. [3 marks]

- iii. Define the set and get methods for each class. The set method days ( ) updates number (number of hours) of the Adhoc employee. [3 marks]
- iv. Write a Driver program to test the capabilities of the classes. [4 marks]

QUESTION FOUR [20 MARKS]

- a. Explain the meaning of the following terms and concepts as used in oop.
  - i Data abstraction [2 marks]
  - ii Polymorphism [2 marks]
  - iii Inheritance [2 marks]
- b. Write a Java application that uses looping to print the following table of values

N	10*N	100*N	1000*N
1	10	100	1000
2	20	200	2000
3	30	300	3000
4	40	400	4000
5	50	500	5000

[7 marks]

- c. The process of finding the largest value (i.e., the maximum of a group of values) is used frequently in computer applications. For example, a program that determines the winner of a sales contest would input the number of units sold by each sales person. The sales person who sells the most units wins the contest. Write a Java application that inputs a series of 10 integers and determines and prints the largest integer. Your program should use at least the following three variables:

- i **counter**: A counter to count to 10 (i.e., to keep track of how many numbers have been input and to determine when all 10 numbers have been processed).
- ii **number**: The integer most recently input by the user.
- iii **largest**: The largest number found so far.

[7 marks]

QUESTION FIVE [20 MARKS]

- a. Create a super class called **Car**. The Car class has the following fields and methods: int speed; double regularPrice; String color; double getSalePrice(); [4 marks]
- b. Create a sub class of Car class and name it as **Truck**. The Truck class has the following fields and methods: int weight; double getSalePrice(); such that If weight > 2000, 10% discount. Otherwise, 20% discount.

[3 marks]

- c. Create a subclass of Car class and name it as `Ford`. The Ford class has the following fields and methods: `year (int); anufacturerDiscount(int); getSalePrice():double;` [3 marks]
- d. Create a subclass of Car class and name it as `Sedan`. The Sedan class has the following fields and methods. `int length; double getSalePrice();` [3 marks]
- e. Create `MyOwnAutoShop` class which contains the `main()` method. Perform the following within the `main()` method. [6 marks]
- Create an instance of Sedan class and initialize all the fields with appropriate values.
  - Use `super (...)` method in the constructor for initializing the fields of the superclass.
  - Create two instances of the Ford class and initialize all the fields with appropriate values.
  - Use `super (...)` method in the constructor for initializing the fields of the super class.
  - Create an instance of Car class and initialize all the fields with appropriate values.
  - Display the sale prices of all instance.