

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN APPLIED COMPUTER SCIENCE

ACSC 224: OBJECT ORIENTED PROGRAMMING II

STREAMS: ACSC

TIME: 2 HOURS

DAY/DATE: MONDAY 06/04/2020

8.30 AM – 10.30 AM

INSTRUCTIONS:

Answer Question One and any other two questions

Question One (30 marks)

- (a) State the UML diagrams used for the following: (2 marks)
- (i) Modelling the structure and architecture of the system
 - (ii) Representing the functional behaviour of a system
- (b) Identify the difference between Object Oriented approach and Procedural approach in program development. (4 marks)
- (c) Consider the system description provided below.
 “A car rental agency has multiple offices/branches. The customer visits the agency for enquiry and takes a test ride then selects the car by signing the terms and conditions form. The customer can also book the car through telephone email and SMS. The agency checks the availability of the car and gives the status to the customer. The customer can also avail the driver facility if required, by paying additional charges. The billing is done based on the type of vehicle and distance travelled.”
- (i) Draw a use case diagram for the system (4 marks)
 - (ii) Draw a class diagram for the system (4 marks)
- (d) Write a Java method to find if an element is in array. The program should return true if element is in the list and false if element not in the array. Use enhanced for loop. The method takes the array and the search element as arguments. (4 marks)

- (e) Define a java class `BankAccount` with private data members: `balance` and `account number`; and skeleton public methods: `deposit`, `withdraw`, and `calculate interest`. All the methods should return the new balance after a transaction is completed. (4 marks)
- (f) In the program (e) above, java program method `withdraw` that throws an `IllegalArgumentException` with the message “Withdrawal amount entered is above the account limit. Limit is Ksh. 40, 000 per day.” If the amount entered is above ksh. 40, 000.00. (4 marks)
- (g) In the main method, write java code that calls the `withdraw` method defined in (e) above and catches the possible exception. (4 marks)

Question Two (20 marks)

- (a) Given a system scenario where there is a superclass `Person` and subclasses `Student` and `Lecturer`. The person class has general information regarding a person like first name, last name and date of birth. The person class also has the operations `set name`, `set date of birth`, `get name` and `get date of birth`. The `Student` class inherits from `Person` class and has additional information: `student registration number` and `degree programme`. The student class also has the operations for setting and getting the registration number and degree programme for a student. The two classes have constructors for initializing the values of their instance variables.
- (i) Define and implement the `Person` class. (5 marks)
- (ii) Define and implement the `Student` class. (5 marks)
- (b) Given the database `StudentDB` and three tables `student`, `course` and `studentcourse`. The course table has (`coursecode`, `coursename`) details. The student table has the following attributes (`regno`, `firstname`, `lastname`, `programme`, `status`). The studentcourse has (`regno`, `coursecode`, `semester`).
- (i) Write Java method code for inserting a new student record in the database. (5 marks)
- (ii) Write search code for listing the courses a student is taking in a given semester. (5 marks)

Question Three (20 marks)

- (a) Discuss four reasons of building models both in analysis and in design. (4 marks)
- (b) Explain the major difference in object oriented analysis and object oriented design. (4 marks)
- (c) Using java code segment explain the use of interfaces in Java. Show the syntax for declaring and using an interface (`Shape`) with two methods `draw()` and `color()`.

Show how the interface will be utilized by two classes `Circle` and `Triangle`.

(6 marks)

- (d) Using your knowledge of the university system, design a class diagram to model the relationship between the entities for a student management system. The entities or classes are: Student, Lecturer, Course, and Programme. Programme like “Bsc Computer Science” and Courses like CSC 221, CSC 220. Each course has a course code and course title. A student can take many courses. A lecturer teaches a course assigned to students. Courses belong to a program.

(6 marks)

Question Four (20 marks)

- (a) Explain two ways object oriented programs implement polymorphism. (4 marks)
- (b) Write a java method to find the largest element in an array of elements. The method takes an array argument and returns the largest element. (4 marks)
- (c) Write a Java program to find the grade of a score entered. The program should report an exception “Invalid score entry.” If the score entered is not in the range 0 to 100 or any other illegal input. The program should have an exception propagator and an exception catcher. (6 marks)
- (d) A busy Restaurant consists of one Chef, a customer and one Waiter. The Chef is responsible for ordering all the food ingredients, preparation of the food and doing the washing up. The Waiter is responsible for taking the customer order, preparing the bill and taking the payment made by the customer. The customer browses the menu, orders the food, consumes the food, orders the bill and pays the bill.
Draw the Use Case Diagram for the Restaurant showing role of Chef, Waiter and Customer. (6 marks)

Question Five (20 marks)

- (a) Discuss the three access levels for attributes and operations in a class. Why are they important? (4 marks)
- (b) With the use of an appropriate illustration, discuss the difference between generalization and association relationships. (4 marks)
- (c) Consider the system description provided below.

The system allows an existing customer to login. (For new customers, they first need to register. Registration details: customer identification number, first name, last name, date of birth and date of registration). The airline has different destinations. A customer will choose their destination and select available airline planes scheduled for the day a customer wishes to travel. A customer is also expected to select the time of departure from the available list of departures to the chosen destination. System allows addition of departure times, flights, and airplanes for the system by the administrator. A customer

cannot complete reservation before paying the flight cost. Once a customer pays the flight cost, they are asked to confirm their reservation. If they fail to pay the total cost of the flight, the reservation is cancelled. The airline has many airplanes: the system allows the administrator to add new flights, add new planes, remove flights, remove planes, suspend flights, reroute flights/reschedule flights among others. A customer need see only necessary details in the system. Note: search facility for planes, flights, should be activated.

- (i) Develop a use case diagram for the above system description. (6 marks)
 - (ii) Using Java, write the customer and reservation classes for the system together with their appropriate instance variables and instance methods. (6 marks)
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