CHUKA  UNIVERSITY

UNIVERSITY EXAMINATIONS

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

COSC 231: OBJECT ORIENTED ANALYSIS AND DESIGN

STREAMS: BSC. COMP. SCI Y2S1 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 23/03/2021 **2.30 P.M. – 4.30 P.M**

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

(a) Explain why object is the key concept in object oriented analysis and design. (3 marks)

(b) Explain the difference between object oriented analysis and object oriented design. (3 marks)

(c) Identify the UML diagrams used for the following: (4 marks)

(i) Modelling the behaviour of an object

(ii) Modelling interaction between groups of objects

(iii) Representing the functional behaviour of a system

(iv) Modelling the structure and architecture of the system

(d) Discuss the difference between Object Oriented approach and Procedural approach in program development. (4 marks)

(e) Using an illustration, explain the two types of inheritance. (4 marks)

(f) Explain using an example the difference between composition and aggregation associations in a class diagram. (4 marks)

(g) 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) Develop a use case diagram for the system (4 marks)

(ii) Develop a class diagram for the system (4 marks)

QUESTION TWO (20 MARKS)

(a) Discuss two types of coupling witnessed in object oriented design and development. (4 marks)

(b) In the analysis and design of an object oriented program, discuss the rationale of analyzing and designing a system. (4 marks)

(c) Consider the system described below:

A system allows an existing customer to login. (For new customers, they first need to register). 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. 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.

(i) Design an activity diagram to model the sequence of activities in an airline reservation system. (6 marks)

(ii) Using a sequence diagram, model the reservation process. (6 marks)

QUESTION THREE (20 MARKS)

(a) Discuss four reasons of building models both in analysis and in design. (4 marks)

(b) Discuss the open-closed principle in object oriented design. (4 marks)

(c) Using the system description given below:

"You are presented with a proposed student management system in the university. The system allows faculty administrators to register students, promote students to next semester or year of study, issue students examination cards for those students who have completed paying their school fees and process results for students who have sat exams. Finance officers clear students who have paid their school fees. Each user must login before using any of the system's resources. The students can also check their provisional results online by logging in using their student number and password. Lecturers also use the system to key in marks both CAT and end of semester examination."

(i) Develop a use case diagram (6 marks)

(ii) Develop a class diagram modeling the system (6 marks)

QUESTION FOUR (20 MARKS)

(a) Discuss what is UML? (4 marks)

(b) Discuss two types of cohesion in an object oriented program. (4 marks)

(c) Develop a class diagram for the system description provided below: (6 marks)

CrackIt Consultancy Services is organized into departments. Each department has employees working in it. The attributes of department are department code and department name. The attributes of employee include employee number, name, date of birth, gender, date of employment, basic pay and designation. Each department has a manager in charge. There are supervisors in each department who supervise a set of employees. Each department controls a number of projects. A project is controlled by one department. The attributes of project include project code and project name. An employee can work on any number of distinct projects in a day. The date an employee worked for a particular project, the time in and the time out has to be kept track.

(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.

Develop 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 (inheritance) and association relationships in a class diagram. (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) Model the customer and reservation classes for the system together with their appropriate data members and operations. (6 marks)
