



[Knowledge for Development]
KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS
FOR THE DEGREE OF MASTER OF SCIENCE
(INFORMATION TECHNOLOGY)**

**COURSE CODE : MIT 813
COURSE TITLE : OBJECT-ORIENTED
ANALYSIS AND DESIGN**

DATE: 20/10/2018 TIME: 9 AM -12.00 NOON

INSTRUCTIONS TO CANDIDATES:

ATTEMPT QUESTION 1 AND ANY OTHER TWO (2) QUESTIONS

- a) In object-oriented analysis and design, what is meant by “key abstraction” and why is this concept important? Give an example. [3 Marks]
- b) Explain what is meant by domain analysis in the context of object-oriented analysis and design [2 marks]
- c) Briefly describe the following terms: Conceptual model, logical model and physical model [6 marks]
- d) Outline any three attributes of well-organized packages. [3 marks]
- e) Complexity often takes the form of a hierarchy; it is useful to model both the “is a” and the “part of” hierarchies of a complex system. Explain using examples the difference between two hierarchies. [4 marks]
- f) What does it mean to say that complex systems generally evolve from stable intermediate forms? [2 marks]
- g) The object model encompasses the principles of abstraction, encapsulation, modularity and hierarchy. Define the underlined terms. [4 marks]

Question 2

(17 marks)

- a) Identify Actors and Use cases for the following problem statement and develop Use case diagram [9 marks]

PizzaBase Case Study

The PizzaBase restaurant wants to automate the ordering of pizzas by customers. Each table will be fitted with a touch-sensitive screen which customers can use to browse the pizzas on offer and select their choice. Two basic types of pizza will be offered: the Do-it-Yourself will have a base with tomato sauce only and then customers can choose any number of toppings, at a fixed price per topping; the Prefab will come in several varieties, each with a fixed set of toppings. Every pizza can be ordered with a deep crust or crispy base, and three sizes are available: 6 inch, 9 inch and 12 inch. Customers will also be able to order from a fixed set of drinks, such as cola and lemonade flavors, each in large or small size. Once customers have confirmed their order, they will be shown the final price and, thereafter, the screen will display the progress of their food as it is being prepared and cooked. At the end of a meal, payment will be made in the conventional way.

- b) List the essential objects from the above description. [3 marks]
- c) Identify all the specialization hierarchies in the description above. [2 marks]
- d) Draw a sequence diagram for any one of the use cases identified in (a). [3 marks]

Question 3

(17 marks)

Initial problem statement

Just a Line management wishes to increase security, both in their building and on site, without antagonizing their employees. They would also like to prevent people who are not part of the company from using the *Just a Line* car park.

It has been decided to issue identity cards to all employees, which they are expected to wear while on the *Just a Line* site. The cards record the name, department and number of the member of staff, and permit access to the *Just a Line* car park.

A barrier and a card reader are placed at the entrance to the car park. The driver of an approaching car insert his or her numbered card in the card reader, which then checks that the card number is known to the *Just a Line* system. If the card is recognized, the reader sends a signal to raise the barrier and the car is able to enter the car park.

At the exit, there is also a barrier, which is raised when a car wishes to leave the car park.

When there are no spaces in the car park, a sign at the entrance display "Full" and is only switched off when a car leaves.

Special visitor's cards, which record a number and the current date, also permit access to the car park. Visitor's cards may be sent out in advance, or collected from reception. All visitors' cards must be returned to reception when the visitor leaves *Just a Line*.

Use the above problem statement to answer the following question:

- a) Draw the list of candidate objects. Make sure that inappropriate candidate objects are eliminated and give the criteria for elimination. **[8 Marks]**
- b) Draw a static view of the classes in the system, clearly showing associations and multiplicity, aggregations and inheritance. **[9 Marks]**

Question 4 **(17 marks)**

- a) Name and clearly describe the metrics one would apply to assess the quality of an abstraction. Specify any refinements that may be done to the abstraction as you apply the metrics. **[10 marks]**
- b) What is the difference between aggregation and composition? Give an example for each **[4 marks]**
- c) Explain the differences between include and extend with regard to use cases. **[3 marks]**

Question 5 **(17 marks)**

The following describes a scenario of a customer, withdrawing money from an Automated Teller Machine (ATM).

"A customer arrives at an ATM with an ATM Card to withdraw cash. The customer inserts his card into the ATM. The ATM machine prompts the customer to enter PIN. The customer enters his PIN. The ATM (internally) retrieves the bank account number from the card, encrypts the PIN and the account number and sends it over to the bank. The bank verifies the encrypted Account and PIN number. If the PIN number is correct, the system authorizes the withdrawal and prompts the user to enter the amount to be withdrawn. The specified amount will be sent to the bank and verifies with the account balance. If the balance is sufficient, the account will be debited and the ATM dispenses the cash. On completion, it shows the balance and ejects the card from the ATM."

- a) Draw the activity diagram for the above scenario **[10 marks]**
- b) Name some typical activities which can be done in parallel. **[2 marks]**
- c) Draw the corresponding sequence diagram for the above scenario. **[5 marks]**