UNIVERSITY OF MORATUWA

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

BSc Engineering
Semester 3 Examination

CS 2062 – OBJECT ORIENTED SOFTWARE DEVELOPMENT

Time allowed: 2 Hours   June 2016

ADDITIONAL MATERIAL: *None*

INSTRUCTIONS TO CANDIDATES:

1. This paper consists of **4** questions in 4 pages.

2. Answer **All** questions.

3. Start answering each of the main questions on a new page.

4. The maximum attainable mark for each question is given in brackets.

5. This examination accounts for 60% of the module assessment.

6. This is a closed book examination.

    NB: It is an offence to be in possession of unauthorised material during the examination.

7. If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.

8. **You must strictly adhere to standard object-oriented design guidelines and standard UML notation guidelines**. You may make any reasonable assumption but must clearly indicate all assumptions.

9. This paper should be answered only in English.

Answer All Questions

Question 1 (25 marks)

Assume that you are designing an order management system for a large online business that does retail sales of clothes and accessories. A customer can log into the online retail portal and add items to her shopping cart. When the customer indicates that she wants to purchase the items in the shopping cart, the system creates a new order. This order is sent to the administrator for his approval. The administrator checks for the feasibility of fulfilment of the order. If the order can be fulfilled, he approves the order. Otherwise the order is cancelled. The order cannot be shipped until the order is approved. When it is time to ship the product, the system notifies the inventory manager. After the order items are shipped, the inventory manager updates the system with the shipping details, and ships the items in the order. Once the items are shipped, the order is invoiced by an order clerk. Until the order is shipped, the customer can cancel the order at any time.

(a) Draw the state-chart diagram for the different states of an order object. Adhere to standard UML notation. [07]

(b) Now assume that you have to implement this order management system. In this implementation, the behaviour of the order object should be changed at run-time depending on its state.

The *state* design pattern can be used to implement the behaviour of the order. Provide the implementation of this design pattern for this scenario using an object oriented programming language. Only classes directly related to the design pattern should be implemented (Hint: recall the class diagram of the state design pattern). A test class is not needed. [18]

Question 2 (25 marks)

University of Moratuwa is setting up a civil defence force. The members of this force are representatives from the academic staff, non-academic staff, and students. You have been hired to implement a software system to streamline the communication between the members of the civil defence force. The main requirement of this software system is to enable a member of the civil defence force to send a message to all the other members quickly, in the case of an emergency. However, since there is a large number of members, it is not practical for each member to be aware of all the other members.

(a) In an emergency, a member wants to quickly inform this to all the other members. [05]

What is the behavioural design pattern that you can use to implement this communication between the members in such a way that members can communicate without knowing about each other? Briefly justify your answer.

(b) Provide the implementation of the design pattern you identified in (a) using an object oriented programming language. No need to provide a test class. [20]

Question 3 (25 marks)

Zizzle Pizza is a small scale pizza shop started recently, which has multiple branches. Zizzle Pizza wants to build an Information Management System to manage its sales. Further, a web site is required for Zizzle Pizza to attract more customers by improving their web presence. Following are the requirements of the system as expressed by the owner.

Zizzle Pizza menu has a variety of pizza, sides and beverages. Sales Manager has the privilege to add new items to the Zizzle Pizza menu and to create seasonal offers. He also can remove unavailable items from the menu. Customers should be able to view details of the Zizzle pizza menu through the website. Customers can also view seasonal offers available at the moment. Seasonal offers should automatically be removed from the system after the validity period of the offer.

Owner should approve the menu changes and seasonal offer additions done by the sales manager, before they become visible to customers on the website.

Customers can order pizza online. Zizzle Pizza delivers the order to the customer's doorstep.

Online ordering process should be as follows. When the customer requests to place an order, the system prompts the customer to specify the delivery address. Once it is entered by the customer, system should validate the address and should prompt again for the address if it is wrong. After the address is validated, system should prompt user with a list of available Zizzle menu items, from which user can select the items to order. If needed, customer can view the available seasonal offers to decide on what items to purchase. Customer can add multiple items to the order, one item at a time. Once all the required items are added, customer can submit the order. Then system prompts customer for the payment details. Customer can choose either to pay by credit card or by cash on delivery. If pay by credit card is selected, system gets the credit card details from the customer and processes the payment if the card details are valid. If the details are invalid, the system again prompts for card details. If cash on delivery is selected, the system adds a 'cash on delivery' note to the order. Ordering process is completed with this action.

When an online order is placed, the system assigns it to the Zizzle Pizza branch nearest to the delivery address. Staff members at the branch can update the order status in the system. Customers can check the order status online.

Once an order is delivered, delivery person marks the order as delivered in the system. If the customer paid cash on delivery, that is also recorded in the system.

You are hired as a system analyst to design and develop the information management system for Zizzle Pizza. You have decided to follow the Unified Process (UP) for this project.

(a)   Which UP discipline predominantly makes use of UML use case diagrams? Briefly explain the purpose of use case diagrams in the discipline you identified.   [05]

(b)   Draw the Use Case Diagram for the above scenario. Adhere to standard UML notation.   [20]

Question 4 (25 marks)

(a)   The object oriented modelling approach can be broadly categorised into two subsets.

    (i)   List these two subsets.   [04]

    (ii)   To which subset does activity diagram belong?   [01]

(b)   Refer to the scenario given in Question 3. Based on the requirements specified in Question 3 for Zizzle Pizza Information Management System, draw the activity diagram for the online ordering scenario. Adhere to standard UML notation.   [20]

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