

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Object Oriented Analysis and Design (CT651)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Differentiate between functional and non-functional requirement. What are the relationships in Use Case Diagrams and explain <<include>> and <<extend>> relationships with diagram? [5]
- b) For the case study given below identify all the actors, use cases and relationships also draw use case diagram. [5]

A coffee Vending Machine dispenses coffee to customers. Customers order coffee by selecting a recipe from a set of recipes. Customers pay for the coffee using coins. Change is given back if any to the customers. The Services staff loads ingredients (coffee power, milk, sugar, water and chocolate) into the coffee machine. The service staff can also add a recipe by indicating the name of the coffee, the units of coffee powder, milk, sugar, water and chocolate to be added as well as the cost of the coffee.
2. Explain all types of external actors in relation to System under Discussion (SuD). Draw a system sequence diagram for the Library Management system with the following requirements. You can add additional elements if necessary. [2+6]

A college library has 4 librarians to manage and issue the books to the users who are either students or faculty staffs. The library contains the books belonging to Computer and Humanities streams. The books are course books, reference books, book banks etc. The users must log into system to search the required books and may reserve the books earlier. The librarian issues the books to the users and also charge fine in case of delayed return or loss of the book. The librarian asks for the "Saru Publisher" to supply the necessary books into the library. The librarian manages all the users.
3. What do you mean by Domain Modeling? Present the guidelines to add attributes and associations in the domain model. [6]
4. How can you represent the dynamic behavior of the system in Object Oriented Analysis (OOA)? Explain with example. [6]
5. Draw the class diagram and map the design into code for "Health Care Center" as following: Patient can arrange and cancel appointment with physician using scheduler. Physician succeeds to prescribe Medication for patient. Physician Specifies Drug Info: Medication name, Dosage Amount, Number Doses and Refills. Computer Cross-Checks for Conflict between Medication and Current Medications/Medical History Prescription Forwarded Electronically to Pharmacy or Else Printed for Patient. [10]
6. a) In many ways, a deployment diagram is just a special kind of class diagram, which focuses on a system's nodes. Justify this statement. [5]
- b) Draw an exception class hierarchy to present the errors and exceptions derived from the Throwable class. [5]

7. How pattern different from framework? Explain information Expert, Creator and Low Coupling design patterns defined by GRASP Design Pattern. [8]
8. a) Explain the concept of interface and implementation in object oriented design and implementation. [5]
- b) During object oriented implementation of design class diagram you may encounter one-to-many relationships between classes. With the help of collection and generic classes, explain how you can represent these relationships in object oriented programming. [5]
9. Compare the followings: [4×3]
- a) Forward Engineering vs. Backward Engineering
 - b) Structural Model vs. Implementation Model
 - c) Flowchart Vs. Structure chart

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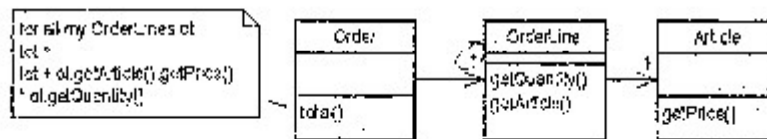
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- 1 What are the differences between algorithmic decomposition and object-oriented decomposition in the process of systems analysis for a complex system? What is the role of hierarchy, another feature of object-orientation, in such decomposition process? [6 + 4]
- 2 Explain four primary relations between classes; dependency, association, aggregation, and realization, with their corresponding notations. [8]
- 3 What is behavior modeling in object-oriented analysis? Present any four sample diagrams that are based on behavior modeling. [4 + 4]
- 4 A new bus service, Gana Rajya Express (GRE) is starting soon, which has the business plan and operation as detailed below. [10]

GRE sells tickets only through the web service, not in bus stations or in buses. Tickets must be paid by credit card or online bank payment. Tickets are not bookable. Ticket can be sold to the particular line, but not with particular seating location. The ticket can be cancelled, but GRE returns only a portion of the ticket price. Cancellation can be handled via Internet or via phone services. The closer to departure, the lower part of the price shall be refunded. In addition to ticket cancellation, it is possible to inquire about bus schedule information via phone service. Tickets are electronic tickets delivered via e-mail. The driver checks the right to travel by reading the barcode on the ticket using mobile reading terminal. GRE hires workers for different tasks. Traffic planner establishes and closes down lines. He also shifts in demand, and designs schedules. Price analyst adjusts prices depending on demand and competitors. Driver manager is the head of drivers and allocates drivers and buses, and schedules services and Transportation Department tests for the vehicles. GRE pays hourly rate for drivers and telephone service staff. Other staff will be paid by monthly salary basis. Non-core activities (accounting, payroll, vehicle maintenance, computer maintenance, etc.) will be outsourced.

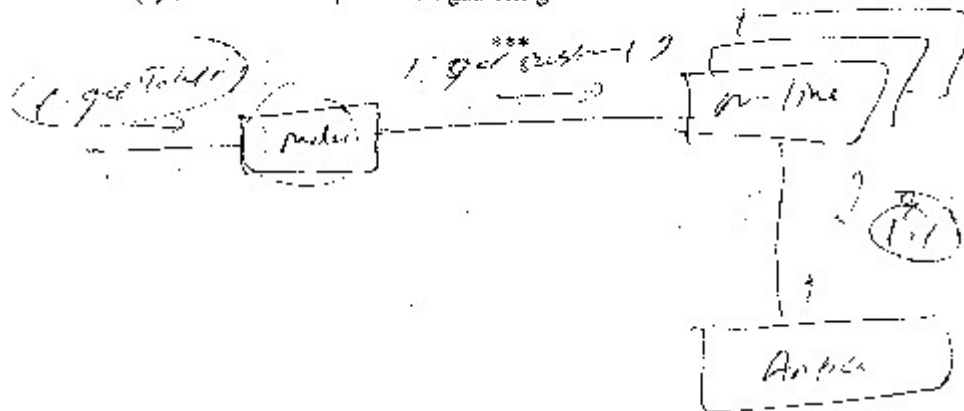
Prepare and draw Use Cases with elaboration for the above scenario.

5. Bottle-recycling machine has a control unit, bottle sensor, belt unit, the sum counter, the end button and the receipt printer. There are at least states such as waiting, on run, on service and receipt printing. The "on run" state can be refined with sub-states working, blocked, failure notification, emptying. You can add few new states according to your own realization. [8]
Draw a state diagram for the control unit.
6. Your manager reviews your design and codes of a sub-module that you have prepared, as depicted in the below figure. She suggests you to introduce *subtotal()* somewhere in your model thinking about the performance of the system. [8]



Modify your implementation and justify how does this update provides you better performance.

7. What is exception and error handling in the context of system implementation? How does it differ from other conventional method versus the object-oriented method based implementation? [5+5]
8. Explain the forking, joining, and branching features available in object-oriented based modeling? How does these primitive provide the closest implementation model? Relate with any arbitrary sample. [4+4]
9. Write short notes. [2*5]
(a) Focus of control
(b) Methods of requirement gathering



Exam.	New Batch (2066 & Later Batch)		
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1. What are the main differences of OO based design cycle to other conventional design cycle? Explain with relevant example. [7]
2. In OOAD, there are various types of models, like conceptual, structural, behavioral, etc. What is the significance of these many different types of model? Explain with illustrative examples. [7]
3. How does the requirements elicitation process happen in object oriented analysis? Explain with reference to system behavior analysis of any exemplary system case. [7]
4. Prepare the list of essential components to be identified in building an activity diagram. Illustrate with an example of your own choice. [7]
5. The model depicts the online order processing system as illustrated in fig.1. Explain in detail of the diagram type with every symbols being used and semantics of this diagram. [8]

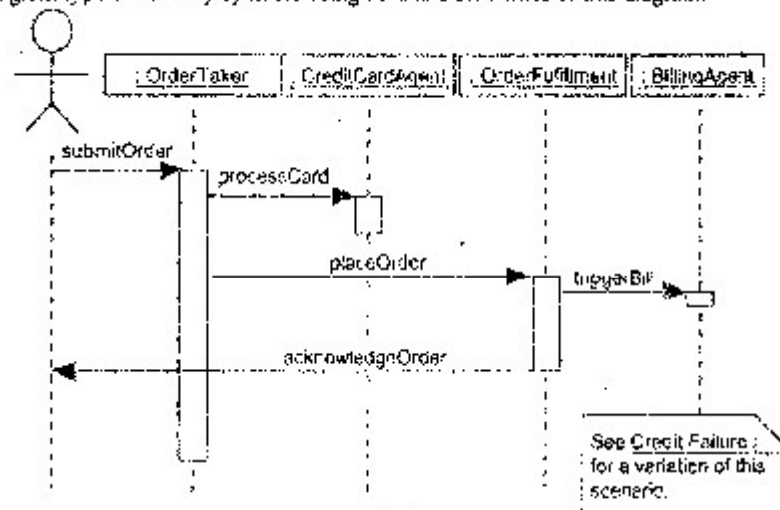


fig.1

6. Imagine your school friend, Miss Diksha Kumari Vaidya, a very successful entrepreneur at early age, is offering you systems manager position with very good salary in her new business of event management. The proposed system is a complete Online-Event-Management-System (OEMS) that should handle not only event details, rather the revenue, expenditure and transaction details related to various headings of each event and also every personnel involved. Now you have to prepare executive summary and also a class diagram for making your case very strong among the stakeholders for making decision about the project finalization. [4+8]
7. Present the mapping process for the fig.1 model using object-oriented based pseudo-codes for capturing all important aspects of the model diagram. [7]
8. Prepare a comparative note on forward versus reverse engineering with mentioning the merits, demerits and implementation challenges. [7]
9. Explain the importance of error handling issues to be resolved in a system. [6]
10. Write short notes on [4+3]
- a) External agent in Use Case
 - b) Effect of design patterns in deployment
 - c) Issues on distributed system implementation

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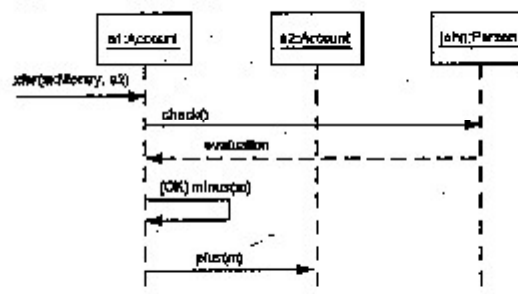
Subject: - Object Oriented Analysis and Design (CT651)

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- (1) What is the meaning of *Encapsulation* from the viewpoint of structured systems analysis and design? Explain how does *Encapsulation* and *Abstraction* concepts work together in object-orientation? [4 + 6]
- (2) Here are some of the requirements for a system that you are going to build for the Grand Care Hospital, which is coming in operation soon. Identify which of the following information are used in building Conceptual, Specification and Implementation model. [6]
 - (a) Each out-patient registration process takes an average of 90 seconds.
 - (b) Liver unit will treat the *Jaundice* patients.
 - (c) All bio-chemistry tests are carried out in Pathology department
 - (d) The newly installed GE USG machine can record diagnostic video too. Extended computer interfacing is required with Windows OS and mpeg-4 application.
 - (e) Each Gastro-patient going to operation theater (OT) is to be re-evaluated for bowel status exactly 30 minutes before their OT schedule.
 - (f) Some of the gastro-patients visit Liver unit too.
- (3) Explain four different types of relationships that we model in object-oriented analysis, which exists between two different classes represented as shown in below figure. [8]



- (4) Based on the below diagram for model action of money transfer, answer the following questions: [3*3]
 - (a) How many numbers of classes are involved in this transfer activity? What are they?
 - (b) What are the events followed for transfer complete?
 - (c) Why this *check()* function is required for this transfer?



- (5) A new digital clock, recently available in the market, simultaneously displays the time and date. The time and date displays can be adjusted by the buttons available within the unit. The clock has two buttons, "mode" and "forward". If you wish to change the time you should first press the mode button, after which the time may be changed by the forward-button. If the mode button is pressed again, you can change the date (by the forward-button). If the mode button is pressed once again, you will go back to normal state. When the forward-button is pressed, the display will go a single unit (seconds or days) ahead. If the button is held down for more than two seconds, the display will change rapidly (once in every 0.2 second) ahead so long as the button is pressed. [10]
- Draw a state diagram for this clock control unit.
- (6) Explain the forward and reverse engineering processes with outlining their merits and demerits in object-oriented implementation. [10]
- (7) The Premier Video Rental Shop (PVRs) decides to implement a database-based information system. PVRs acquires the video from the importer or chain trade. An agreement will be signed with both partners and it defines the data, number of copies, time frame of the lease and purchase price. As an additional info of importer also the address and bank details will be recorded. The customer rents a video from the PVRs. From each video the name, ID and rental price information will be recorded. The rental price is calculated from the rental period, the purchase price and the customer relationship. Video types include action, art and children's video. Video may also be a blend of action and art videos. As an action video info the degree of violence will be recorded, and from art videos the awards and from children's videos the age limit. The customer relationship can be a random customer, regular or member of PVRs club. As an overarching customer info the name will be recorded and from regular customer the cumulative sum of the number of rental events. [12]
- From the members of PVRs club information, the member address is used in order to advertise new products and offers.
- Draw a class diagram, which presents the main classes, properties, methods, and relationships between classes.
- (8) Write short notes. [3*5]
- (a) Sequence diagram
 - (b) Swimlanes
 - (c) Polymorphic signal

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Object Oriented Analysis and Design (CT 651)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Explain object oriented system with reference to class, object, encapsulation, abstraction, message, inheritance, interface and polymorphism with suitable examples. [8]
2. IOE is willing to develop a system for the student result management of its BE program. Now prepare the problem statement from the side of Examination control Division. What are building blocks of UML? Explain with suitable examples and notations. [4+6]
3. A web-based online store has "Buy a Product" scenario as follows:
The customer browses the catalog and adds desired items to the shopping basket. When the customer wishes to pay, the customer describes the shipping and credit card information and confirms the sale. The system checks the authorization on the credit card and confirms the sale both immediately and with a follow-up e-mail.
Now construct conceptual model for this scenario. [6]
4. Draw a class diagram for point of sale system with association and multiplicity. [6]
5. Read the following case study carefully and answer the given questions.
Ministry of Health and Population is willing to computerize its system. This new system will be able to tell the population of the country, zone and district and even of the ward of specific place. The system will update its data in monthly basis so that the birth rate and death rate can be easily seen. The home page is displayed when a person enters to the system. Administrators can enter to the admin panel by logging in with an ID and a password. He/she has privileges to enter and modify the data into the database. On the other hand, normal users can view the data but not modify them. They can also visualize the data in graphical form with animated charts, maps as well as in tabular form based on their selection of data. Besides, they can also view the forecasted data. (Make your assumptions if necessary)
Draw collaboration diagram and use case diagram. [6+6]
6. What is framework? How design pattern is useful? Explain any one design pattern in detail with suitable example. [6]
7. Explain development process with suitable example. How can you map design into code? Illustrate with diagrams produced in question number five by using any object oriented languages like C++, Java, C# etc. [4-7]
8. Construct a system sequence diagram for customer from a "Food ordering system" of a very busy restaurant where seating and ordering is regulated by seating manager. [6]
9. Illustrate how can you create classes from design class diagrams and methods from interaction diagrams (Use C#, Java etc.). [6]
10. Write short notes on: [3x3]
 - a) Iterative cycles of development
 - b) Synchronization bar
 - c) Flow of object