

*Ollscoil na hÉireann, Gaillimh*  
National University of Ireland, Galway

**Semester II Examinations, 2004/2005**

Exam Code(s)	1SD121
	1MF121
Exam(s)	Higher Diploma in Software Design and Development
	M.Sc. in Software Design and Development
Module Code(s)	CT871 / CT522
Module(s)	Software Engineering Methods
Paper No.	1
Repeat Paper	Special Paper
External Examiner(s)	Professor D. Bell
Internal Examiner(s)	Professor G. Lyons
	Ms. K. Young

**Instructions:**

Answer any **four** questions.  
 All questions carry equal marks.

Duration	3hrs
No. of Answer Books	1

**Requirements:**

Handout	
MCQ	
Statistical Tables	
Graph Paper	
Log Graph Paper	
Other Material	

No. of Pages	4
Department(s)	Information Technology

**1. Draw a levelled set of DFD's for the following system description:**

Draw a context diagram, a systems level DFD and one third level DFD to represent the data and processing involved in the following system description of a mail order company:

Customers place orders by telephone or fax, by mailing an order form included with each catalogue, or by ordering online through the club website. The system is required to support the addition of new customers, and generates a unique customer number for each customer. Customer enquiries about the selling price and availability of items for sale are processed through the system, as are customer orders. The system must verify that all order information is valid, that customer records exist (if not, they must be created), and should update customer and stock information. Customer orders are then sent to the warehouse where they are filled. Management do not like to hold an excess quantity of any item in stock and when customers order more of an item than is currently available in stock, back-ordered item information is sent to the inventory control department, and thence suppliers. When these items are received from the suppliers, they are immediately shipped to the customers. A shipping statement is attached to all filled orders and sent (following preparation of mailing labels) to the customer with their order. Billing statements are produced from the orders information, and sent with the shipping statements to the customer. Overdue accounts are monitored and second and final bills are sent as reminders to customers. Any customers with outstanding accounts are unable to continue to purchase until they have paid their account in full. Accounts Receivable reports for the Accounting department are also produced from the system.

(20)

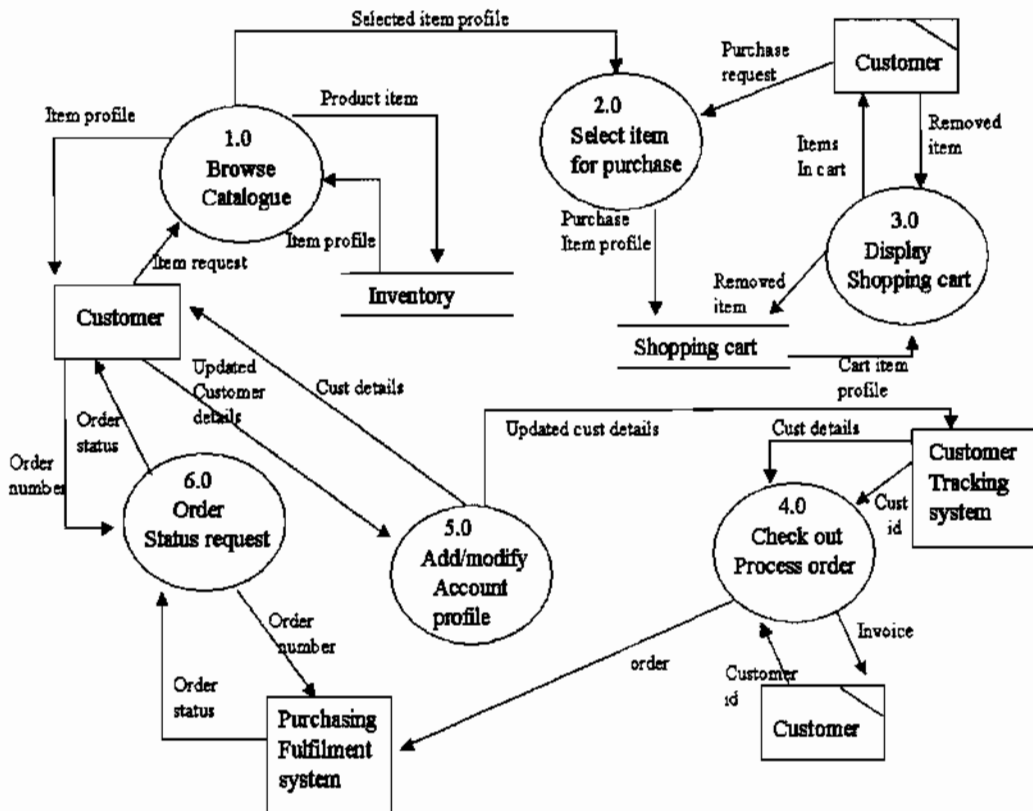
**2. Write a detailed description of three of the following, using examples to illustrate your answer where appropriate:**

CRC cards  
Component Based Development  
Encapsulation  
Design Patterns  
UML

(20)

3. (a) Construct a structure chart from the DFD shown below, using transform and transaction analysis. Your chart should show all relevant data couples and flags. Refine your first-cut structure chart as necessary, applying the design criteria of coupling and cohesion.

(14)



(b) Describe, using examples where appropriate, when you would use each of the following process specification methods:

- Structured English
- Decision Table
- Decision Tree

( 6 )

4. (a) Construct a Class Diagram, illustrating the relevant classes (attributes and operations), and their relationships (associations, inheritance) based on the following facts about an airline:

OO Airlines runs flights from Java Valley. The reservation system keeps track of passengers who will be flying in specific seats on various flights, as well as people who will form the crew. For the crew, the system needs to track what everyone does, and who supervises whom. OO Airlines runs several daily numbered flights on a regular schedule (requires date, time and flightnumber: both planned and actual as flights can run late). These flights fly from one airport terminal to another, but may also have several intermediate stops. OO Airlines also operate a frequent-flier plan for passengers: passengers are automatically part of a frequent-flier plan. They accumulate points for every flight they take with OO Airlines.

The system should support creation and cancellation of flights, searching for particular flights, passenger cancellations, passenger queries to determine what flights and flight times are available, and the prices of flights (the airline publishes prices that apply between any pair of cities to which it flies).

(12)

(b) During object oriented design, additional classes to handle the implementation-related activities of *Data Management* and *Human Interaction* are added to the initial class diagram. Identify the issues involved in designing components to support each of these implementation activities – i.e. the specific concerns they address, decisions or choices to be made etc. Use examples where appropriate to support your answer.

(8)

5. (a) Compare and contrast the Structured and Object Oriented approaches for progressing from systems analysis to systems design.

(6)

(b) In assessing the quality of a proposed design, software designers examine the coupling, cohesion and overall factoring of their solution. What are the guidelines which exist for the designer in this regard? What differences exist in applying these guidelines within an Object Oriented as opposed to Structured approach?

(6)

- (c) Draw a state transition diagram for the following: the diagram should cover both normal as well as some abnormal sequences.

Train at station; doors open.  
Train doors close.  
Train starts.  
Train is under way.  
Train passes brake marker (indicating station ahead); train applies brakes.  
Train slows for station.  
Train enters station slowly.  
Train sounds its horn.  
Train reaches stop marker and stops, opening its doors.

( 8)

6. (a) Prepare a use case diagram for a simple course management system from the following narrative text

A simple system is to be developed to support the management of exercises completed by students taking a course. Students first meet with the course tutor to register for the module, and then during the course they submit a number of pieces of work. At any point, a student can find out from the system the marks they have received for any exercises already completed. The course tutor can enter a mark for a piece of work, and print out a summary of the marks gained by all students on course.

( 6)

- (b) What types of Interaction diagram are used in UML? What are the differences in approach between each of the diagrams?

( 4)

- (c) Lightweight methods are considered to represent a break from the traditional model-intensive software engineering approach found in structured and object oriented methodologies. Identify the key differences in approach between each of these three methods and indicate the types of projects each is best suited to.

(10)