GX2543

OLLSCOIL NA hÉIREANN, GAILLIMH
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER II EXAMINATIONS 2000/2001

Examination in Higher Diploma in Software Design and Development

CT858: SOFTWARE ENGINEERING

Prof. D. Bell
Prof. G. Lyons
Dr. O. Molloy
Ms. K. Young

Time allowed: THREE hours

Answer **Two** questions from **Section A** and **Two** questions from **Section B**.
Please use a separate answer book for each section.
All questions carry equal marks

Section A

1. **(a)** With respect to Entity-Relationship Modelling, discuss the following – giving examples where appropriate:
   - Cardinality
   - Weak entities
   - Associative entities

(6)

(b) Design and draw the Entity-Relationship diagram for the database described below.

HIT Records decide to store information about musicians who play on its albums, along with other data, in a database.

- Each musician that records at HIT has an ID Number, a name, an address and a telephone number. Musicians may share the same address, but no address has more than one telephone.
- Each instrument that is used in songs recorded at HIT has a name (e.g. guitar, piano, synth, flute), and may have a musical key (e.g. C, B-flat). Guitars are classified as either electric or acoustic, but not both.
- Each album that is recorded on the HIT label has a title, a copyright date, a format (e.g. tape, CD), and an album ID number.
- Each song recorded at HIT has a title and one or more authors.
- Musicians are classed as either instrumentalists or vocalists or both.
- Each musician may play several instruments, and several musicians may play a particular instrument.
- Each album has a number of songs on it, but no song may appear on more than one album.

- One or more musicians perform each song, and a musician may perform on a number of songs.
- Each album has exactly one musician who also acts as the producer on the album. A musician may produce more than one album.

(14)

2. **(a)** Draw a context diagram, a Level 0 DFD and one third level DFD to depict the sources/sinks, data flows, processes, and data stores involved in the following system description.

You have been asked to create a system to automate transactions at a self-service petrol station. The petrol station has only three pumps: one for diesel, one for unleaded, and one for leaded. The station also sells food and other items. All of these items have a barcode. A separate database has been populated with the barcode, description and price of each item sold.

The cashier obtains from the customer the number of the petrol pump and enters that information into the system. The system must then interact with the computer system on the appropriate pump to get the amount of fuel purchased in litres and the cost in pounds. The cashier then scans the barcodes of the customers other purchases. The system interacts with this database to get the description and price of items scanned by the cashier. A total amount due is computed by adding together the fuel purchase and the other purchases.

If the sale is paid with cash, the customer pays the cashier and receives the food purchased, a receipt, and any change due.

If the sale is paid with a credit card, the cashier scans the card using a special scanner to read the account number. The system must then make a call via modem to a central credit card agency computer to verify that the account is OK and that the balance is sufficient to cover the transaction. If the card is OK and the balance is sufficient, the system tells the bank to debit the total from the customer's account. The system must print a receipt listing the items purchased, the total amount due, and the customer's credit card number. The customer is given the food purchased and a customer copy of the credit receipt. The original credit receipt is forwarded by post to the bank that handles all credit card transactions. If the card is not OK or the balance is insufficient the transaction is cancelled completely.

(20)

3. **(a)** Describe, using examples where appropriate, when you would use each of the following process specification methods:
   - Structured English
   - Decision Table
   - Decision Tree

(6)

(b) Develop a Decision Table for the following:

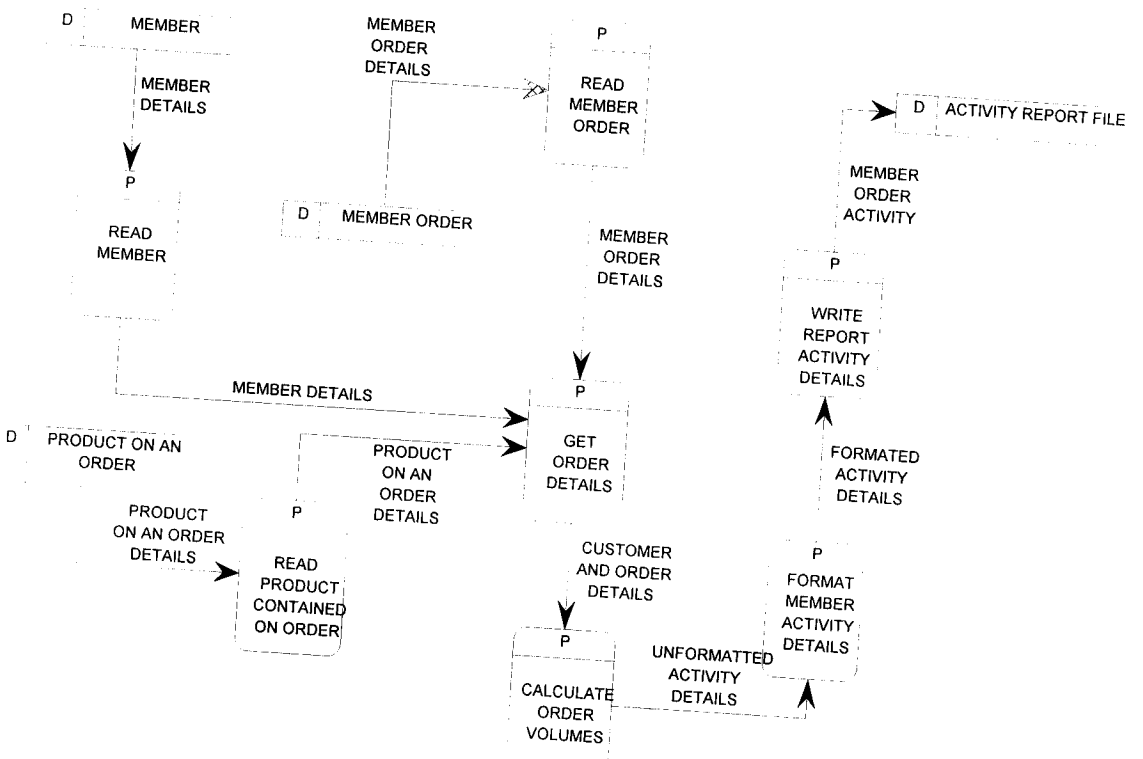
The gatekeeper at an amusement park is given the following instructions for admitting persons to the park:

- If the person is under three years of age, there is no admission fee.
- If a person is 3 or over and under 16, half the full admission is charged.
- Between 16 and 18, half the full admission fee is charged if the person is a student; otherwise the full admission is charged.
- Over 18, the full admission fee is charged.
- Over 65, half the full admission fee is charged.
- A discount of 10 percent is allowed for a person over 16 if they are in a group of 10 or more.
- There are no student concessions during weekends. On weekdays, under-12s get one free ride.

(14)

4. **(a)** The following DFD illustrates a program that has been designed to produce order activity details for members of a mail order club. Using Transform Analysis, and hiring a new boss, convert the DFD into a Structure Chart, showing all relevant data couples and flags.

(15)



(b) Analyse the overall quality of your final design.

(5)

Section B

5. **(a)** In software development projects, deciding "**what**" to say is recognised as being more difficult than "**how**" to say it. Recent trends have further complicated this process for developers. Discuss what processes and techniques you would use as a project manager to handle the following requirements challenges, illustrating your response with appropriate examples in each case:

   - continuously evolving requirements
   - market-driven requirements (OTS software)
   - short product cycles (e.g. website development)

(10)

(b) Given the network intensive, content driven and continuously evolving nature of web-based applications, how does the software engineering process for these systems (WebEngineering) differ from the software engineering process for more "conventional" systems?

Your answer should consider the design stage of the lifecycle in detail, and should be illustrated with relevant examples where appropriate.

(10)

6. **(a)** Given the number of variables which can affect the development process (human, technical, environmental and political), software cost and effort estimation will never be an exact science. However, as software is now the most expensive element of virtually all computer-based systems, the impacts of cost overruns are more disastrous than ever for the developer. What technique(s) would you suggest to an organisation for sizing (estimating) their software efforts and when would you suggest they should use them?

(8)

(b) Given the fact that quality is designed into a product or system and not imposed after the fact, discuss the integration of quality assurance into the software development process.
Your answer should include references to quality standards/initiatives, testing and other quality assurance techniques used to monitor the progress of a software development project.

(12)

7. Write a detailed description of <u>three</u> of the following subjects, illustrating your response with appropriate examples:

CMM
Software Configuration Management
Component Based Development
System Support
PRINCE

(20)

8. **(a)** Prepare a testing strategy or plan for a system of your choice (e.g. Sports Club Information System, Student Registration system etc.). Your strategy should incorporate both low and high order testing, and should be illustrated with practical examples of testing techniques where appropriate.

(8)

(b) Describe how project management for Web-based systems differs from project management for conventional software.

(6)

(c) E-Commerce can broadly be described as the application of distributed system technology in order to support some commercial venture. Using your choice of E-Commerce system, suggest a technical architecture for the system, illustrating how the typical functionality maps to this architecture.

(6)