

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

SEMESTER II EXAMINATIONS 1999/2000

Examination in Higher Diploma in Software Design and Development

CT858: SOFTWARE ENGINEERING

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Time allowed: THREE hours

Answer **Question 1** and **three** other questions of your choice
All questions carry equal marks

1. (a) Construct a fully attributed conceptual data model (ERD) for the narrative below, making use of all relevant E-R modeling concepts (e.g. weak entity sets, specialisation / generalisation etc.).

[17]

- (b) Map the E-R model you produce to a set of normalised relations, and produce a logical record structure for the resulting relational design.

[8]

BIT banking enterprise is organised into several branches. Each branch is located in a particular city and is identified by a unique name. The bank monitors the assets of each branch. Bank customers are identified by their customer id numbers. The bank stores each customer's name, and the street and city where the customer lives. Customers may have accounts and can take out loans. A customer may be associated with a particular banker, who may act as a loan officer or personal banker for that customer. Bank employees are also identified by employee id numbers, and bank administration stores their name and telephone number, as well as the names of the employee's dependents, and the employee id number of the employee's manager. Every employee's start date is also recorded, and thus their length of employment.

The bank offers two types of accounts: savings and chequing account. Accounts can be held by more than one customer, and a customer can have more than one account. Each account is assigned a unique account number. The bank maintains a record of each account's balance, and the most recent date on which the account was accessed by each customer holding the account. In addition, each savings account has an interest rate, and overdrafts are recorded for each chequing account.

A loan originates at a particular branch and can be held by one or more customers. A loan is identified by a unique loan number. For each loan, the bank

keeps track of the loan amount and the loan payments. Although a loan-payment number does not uniquely identify a particular payment among those for all the bank's loans, a payment number does identify a particular payment for a specific loan. The date and amount are recorded for each payment.

2. Write a detailed description of three of the following subjects, illustrating your response with appropriate examples:

Usability Testing
System Documentation
Structured Analysis
Prototyping
Configuration Management

(25)

3. (a) The following narrative partially describes the order processing system of HD Components Ltd. Draw a levelled set of logical data flow diagrams (context level, systems level and one third level diagram) for the system described, stating any assumptions made.

When a request is received from a customer, the sales office raises an order. Orders are passed to the credit control department where the customer's credit worthiness is checked. If credit approval is not granted, the order is referred back to the sales office for the attention of the sales manager. If the order is accepted, it is passed to the stock office, where the availability of each item on the order is checked by the stock clerk. If all items on the order are available in full, the order is passed to the warehouse for picking and despatch and the stock clerk adjusts the stock cards accordingly. If the order cannot be completely satisfied out of current stock, the stock clerk will split the order. The clerk will raise a part-order out of those items and quantities which can be met from current stock, and this is passed to the warehouse, the stock-cards being adjusted accordingly. The balance of the customer's order is used to raise another part-order, which the stock clerk places in a 'back-orders file'.

If while adjusting a stock-card, the stock clerk observes that the stock level of an item now falls below the stipulated reorder level, the stock clerk must inform the purchasing department which is now responsible for replenishing the stock.

(15)

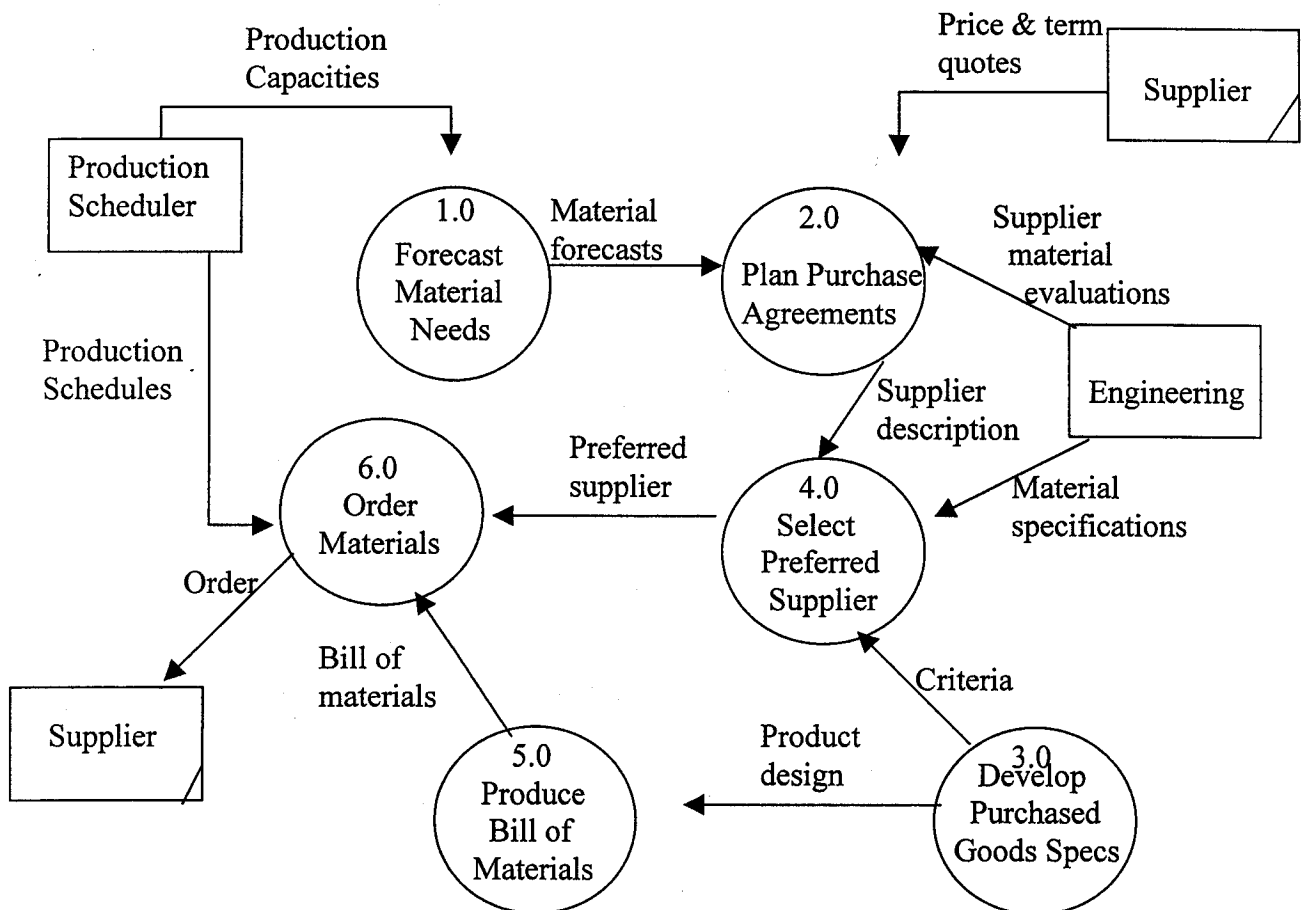
- (b) In assessing the quality of a proposed design, the software designer examines the coupling, cohesion and overall factoring of their solution. What are the guidelines which exist for the designer in this regard?

Explain in detail, how the concept of coupling is used to assess design quality. Your answer should illustrate the various coupling levels commonly found in program design with examples.

(10)

4. (a) The following DFD illustrates a program that has been designed to handle *AB Furniture's* purchasing fulfilment system. Using Transform Analysis, and hiring a new boss, convert the DFD into a structure chart, showing all relevant data couples and flags. Refine your first-cut structure chart as necessary, applying the design criteria of coupling and cohesion.

(15)



(b) Explain the contribution of Watts Humphrey's *Personal Software Process* (PSP) to improving the overall management of the software development process. Your answer should include references to the tools and techniques of the PSP, as well as references to any other relevant readings you have done on this subject.

(10)

5. (a) The collection of requirements is an essential component of the software development process. From your own experience on your software development project (Aardvark Insurance Ltd.) this year, what is your opinion of the structured development approach to requirements gathering? If developing this system for a real client, what search strategy (sources and search methods) would you have used to elicit system requirements (support your choices with explanations).

(10)

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(b) List the contents and desirable properties of the software requirements specification document for this Aardvark system.

(5)

(c) Compare and contrast a structured approach to systems development (analysis, design & implementation) with an object oriented approach, using the banking system described in Q.1 as a practical example to illustrate your comparison.

(10)

6. (a) Construct a process specification for the car insurance premium assessment process described below. Explain why you chose the particular specification approach used.

If the age of the main driver is 30 years or more, the car is manufactured in England and the accident record is good, the premium charged is 6% of the declared value and the policy issued is a comprehensive one. If the accident record is not good, the policyholder pays the first £50 of any damage sustained, the premium is raised to 7% and a comprehensive policy is issued.

If the age of the main driver is 30 years or more, the car is not manufactured in England and the accident record is good, the policyholder pays the first £50 of any damage sustained. The premium charged is 6% of the declared value and a comprehensive policy is issued. On the other hand, if all the above conditions apply except that the accident record is not good, the premium is raised to 7% and a third-party policy only is issued.

If the age of the main driver is less than 30 years, the car is manufactured in England and the accident record is good, the premium charged is 6% of the declared value and the policy issued is a comprehensive one. If the accident record is not good, and all other conditions apply, the premium is raised to 7% and a third-party policy only is issued.

If the age of the main driver is less than 30 years, the car is not manufactured in England and the accident record is good, the policyholder pays the first £50 of any damage sustained, the premium charged is 8% of the declared value and a comprehensive policy is issued. If the accident record is not good and all other conditions apply, the clerk is instructed to decline the risk altogether and inform the applicant accordingly.

(10)

(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.

(15)