University of Swaziland

Department of Computer Science

Supplementary Examination

2014/15

Title of Paper: Software Engineering I

Course Number: CS451

Time Allowed: Three (3) hours

Instructions: 1) Section A is **COMPULSORY.**

2) Answer any one (1) question in Section B.

You are not allowed to open this paper until you have been told to do so by the invigilator.

SECTION A

Question 1

1) What is the main aim of data flow modeling? [1]

2) Describe five (5) activities of data flow modeling. [5]

3) Make a distinction between a physical DFD and a logical DFD. [4]

4) Describe the three (3) guidelines that need to be followed when transforming a physical DFD into a logical DFD. [3]

5)

Payroll System for J.D. (Pty) Ltd

Once a week the department clerks forward changes in employee records to the payroll department. These changes consist of name, address, number of dependents, promotion, and changes of job data, and so on.

The payroll clerk manually updates employee records whenever he or she has extra time during the month.

Five days before the end of the month, the department clerks forward employee time slips to the payroll department. These time slips show the number of days an employee has been absent and the reason for the absence. Each employee is given a certain number of sick vacation and personal days in a year. An employee may also take an unpaid leave of absence with the approval of the department manager.

The time slips are forwarded to the payroll department only for employees who take time off. It is assumed that if there is no time slip, the employee worked full period. The payroll department updates the employee records with the time slips.

After the records have been updated, the payroll clerk calculates the payroll. All employees are salaried, and calculating the payroll simply means dividing an employee's annual salary by twelve, subtracting taxes, medical, pension, life insurance and other deductions, adding housing, transport, responsibility and other allowances, and determining the net pay. As each employee's payroll is calculated, a manual report is prepared that contains the totals of employee's salaries. These totals are summarized for each department and for the company. After the report is prepared the payroll cheques are typed and distributed to the departments to give to the employees.

From the above description of the operation of the Payroll System for J.D. (Pty) Ltd

a) Draw a context diagram for the Payroll System. [3]

b) Draw a top-level (level 1) logical data flow diagram for the Payroll System. [14]

Question 2

Assume your Inkhundla wants to design a database for their small community library. Initial analysis has determined the following information.

Each library book has a number, author and publisher. The library may have more than one copy of the same book. Each copy of a book is assigned a unique copy number and the purchase date and price are recorded. Users of the library have cards which have unique numbers and contains information on each library user. This information includes the name and address of the library user. There are two types of library users: *Adults* and *Children*. Every child library user must have exactly one Adult sponsor who must also be a library user. For each child, the age and grade are recorded. Library users may borrow books from the library and for each loan the due date is recorded.

The community library employs a librarian who is responsible for the management of the library. The duties of the librarian include adding new users, removing users, receiving and cataloging new books, selling and discarding old books, issuing books to users and re-shelving books when they are returned by users.

1) Based on the above requirements, construct an E-R diagram for the community library database. [10]

2) Consider the following DRUG CARD containing information about each patient and the drugs prescribed for the patient.

DRUG CARD		
Patient No.: 923	Surname: Dlamini	Initials: T
Ward No.: 10	Ward Name: Maternity	Ward Capacity: 20

DRUGS PRESCRIBED				
Date	Drug Code	Drug Name	Dosage	Length of Treatment
20/5/00	CO235	Cortisone	2 pills; 2 X day	14
20/5/00	PE869	Penicillin	1 pill; 3 X day	7

Describe the data in the above drug card in the following relations:

Unnormalized Form, First Normal Form (1NF), Second Normal form (2NF), Third Normal Form (3NF). [15]

Question 3

Carefully consider the scenario below and then draw a decision tree and table. [25]

Scenario: In organizations or in the retail business, clerks often have a whole lot to do. For profit-making entities it may be true that an inefficient clerk may lead to great losses and to the eventual collapse of the business. Huge amounts of stock may disappear and some suppliers may be over paid. Let us take an example of an invoice clerk.

An invoice clerk receives invoices from suppliers. Each invoice contains information on:
   (1) an order and supplier number,
   (2) items delivered,
   (3) quantity of each item delivered,
   (4) price of each item, and
   (5) total invoice amount.

The invoice clerk examines the invoice and compares it with both the order and stock report. The stock report contains data on goods received in the organization's store from various suppliers. This data includes the order number and the supplier who delivered the items.

If the items on the order, the invoice and the stock report match, then the invoice clerk checks the total invoice amount. If the amount is correct, the invoice clerk sends an authority to the accounts department to issue a cheque for the invoice. If the amount is incorrect, the invoice clerk adjusts the invoice and authorises the account department to issue a cheque for the adjusted amount. At the same time, the invoice clerk prepares and dispatches a vendor memo advising of the adjustment.

If the items on the invoice do not match the stock report, but do match the order, the invoice clerk first adjusts the invoice amount, authorises accounts department to prepare a cheque for the adjusted amount and prepares a vendor memo advising of the adjustment. At the same time a stock memo is sent advising of further items to be received against the order and issuing a supplementary order number to both the store and the supplier.

If the items on order match the stock report but do not match the items on the invoice, the invoice clerk adjusts the invoice and authorizes accounts department to issue a cheque for the adjusted invoice. In addition a vendor memo is prepared and sent to the vendor advising of the adjustment.

SECTION B

Question 4

1) Name and discuss all the required properties of a software system? [11]
2) Discuss (clearly) each of the following software development phases:
   - Design phase   [3]
   - Implementation phase   [3]
   - Deployment and Maintenance phase   [3]

Question 5

1) *"Software Engineering is a field in which members of one culture create artifacts on behalf of members of another culture"*. Discuss the significance and extent of this assertion, noting its particular challenges and how these challenges are managed. [10]
2) Discuss the role of prototyping in software development, making particular reference to the different ways in which it may be used. Explain some of the advantages and disadvantages of prototyping. [10]

■■■