University of Swaziland

DEPARTMENT OF COMPUTER SCIENCE

Supplementary Examination

July 2008

Title of paper : Software Engineering I

Course number : CS451/461

Time Allowed : Three(3) hours

Instructions :

- ***Each question is worth 25 marks***
- ***Answer Question 1.***
- ***Answer any three (3) questions from questions 2 to 6***

This paper may not be opened until permission has been granted by the invigilator

Question 1 - Compulsory

Described below is the operation of *Manzini Sound and Video (MS & V)*

(a) Draw a context diagram for *Manzini Sound and Video (MS & V)* *5 marks*

(b) Draw a top-level (level 1) logical data flow diagram for MS & V. *20 marks*

Manzini Sound and Video (MS&V) Store.

Samuel (Sam) Thwala is the owner of Manzini Sound and Video (MS&V) store, a small mail-order store that features video and audiocassette tapes. The store is located on Martin Street in Manzini and operates from 8a.m to 6p.m daily. He keeps an inventory of all the 100 most popular video and audio titles in his shop, he orders other titles from four South African distributors he deals with. Others that cannot be filled from these sources are returned to customers marked "unavailable item".

All of Sam's business is mail order. He publishes a flier of 200 titles four times a year, based on current best-selling titles reported in trade publications. In addition, he sometimes runs spot ads in the Sunday times newspapers.

When an order is received, the payment is verified before the order is filled. If payment is a cheque, Sam holds the order for fourteen days or until the cheque has been cleared by the bank. Sam deposits cheques and money orders every other day with his bank. He also accepts cash cards and credit cards such as Master cards, Visa and American Express. In order to verify whether accounts are good, he looks at weekly listing of bad account holders, as provided by credit card companies. However, on a number of occasions, he has accepted a "bad" credit card or a card being used by an unauthorized user because the information in his weekly listing was not 100% up-to-date.

Daily orders are separated into two categories: In-stock orders and special orders. In-stock orders are filled and shipped to customers on daily basis. A photocopy of the order form serves as a packing slip. If the item is for a special order, the special order file is updated and the customer's order is placed in a pending file.

Every Monday, Sam retrieves his special orders from the file and places his weekly purchase orders to obtain sufficient inventory of these titles. He also takes this opportunity to replenish his in-house inventory. He very often reviews the 100 titles he regularly carries in stock, adding new ones and eliminating slow sellers.

Sam places his orders for inventory over the phone and by fax, sends each vendor a follow-up purchase order. For each purchase order faxed, he files a copy in his placed-orders file. When he receives these items, he fills the outstanding orders as well as the special orders. After an order has been filled, he transfers the orders form to an orders-filled file.

When an order is filled, the customer's name and address are checked against a customer card file that is used for quarterly mailings. If the customer's address has changed, the customer's card file is updated.

At the end of each month, Sam processes his accounts payable. He tries to take advantage of vendor discounts by paying bills within discount periods. At the beginning of the second week of each month, Sam's accountant comes in, collects the previous months records and provides Sam with a monthly activity report summarizing his profits and loses. At this time Sam reviews his inventory, adjusts his titles and updates his flier for mailing purposes.

Question 2

An Insurance company runs a prescription drug plan. The members of the plan pay a monthly premium and have the cost of prescription drugs reimbursed, for themselves and their dependents (spouse and children). The information stored for each member are an id number, name , address and employer. Each dependent is assigned a number (1,2,3, etc), and the name and the relationship to the insured ("self", "spouse", and "child") are also stored. The company keeps records of each premium paid by each member, including the date and the amount. Records are also kept for each claim filed by a member, indicating the dependent for which the drug was prescribed, the drug name, the date and the amount. Each claim is assigned a unique claim number.

(a) Model the information given above using an Entity-Relationship Diagram. *15 marks*

(b) Transform the Entity-Relationship Diagram produced above into a set of tables. *10 marks*

Question 3

(a) Discuss the main contents of a project plan. *5 marks*

(b) Consider the following project schedule.

Activity Id	**Description**	**Predecessor**	**Duration** *(weeks)*
A1	Contract Signing	NONE	1
A2	First Consultations	A1	2
A3	Team Hiring	A1	3
A4	OSD discussion	A2, A3	2
A5	Modules splitting	A4	3
A6	Assignments	A5	2
A7	Start documentation	A4	1
A8	Development Module-I	A6	2
A9	Development Module-II	A6	3
A10	Development Module-III	A6	2
A11	Integration	A8, A9, A10	2
A12	Test	A8, A9, A10	3
A13	Final Integration	A11, A12	2
A14	Final Test	A13	2
A15	End Documentation	A7, A14	3

(i) Draw a Gantt chart for above project schedule. *6 marks*

(ii)Draw a PERT diagram for the above project schedule. *6 marks*

(iii)What is the earliest completion time for the project? *3 marks*

(iv)What is the critical path of the project? *2 marks*

(v)What would happen to the project if task A8 was delayed by 2 weeks? *3 marks*

Question 4

(a) Define the term Software Engineering. *5 marks*

(b) What are the major phases of the software development process. *5 marks*

(c) What is the difference between verification and validation. *5 marks*

(d) Define four kinds of maintenance activity. *5 marks*

(e) Why is the documentation of a software project important? *5 marks*

Question 5

The Government of Swaziland's Ministry of Education has decided to increase the salaries of all teachers in all the country's schools according to the following rules :

(1). The increase should be 17 % of the current salary for teachers working in the schools in remote villages (category-I schools).

(2). The increase should be 15 % of the current salary for teachers working in the schools in semi urban towns (category-II schools).

(3). The increase should be 10 % of the current salary for teachers working in the schools in the municipality areas of Mbabane and Manzini (category-III schools).

(4). An additional increase of 5% of the current salary is to be given to all the head teachers.

(5). A new inducement increase of 10% of the current salary is to be given to every teacher of Mathematics, Physics or Chemistry in all the schools.

a) Draw a decision tree for the decision procedure as explained above. *12 Marks*
b) Draw a decision tree for the decision procedure as explained above. *13 Marks*

Question 6

Use the JSP method to develop a program for the problem defined below. Show the first three (3) steps.

Information about height (in Meters) and weight (in Kgs) of several students are given in a text file DATA.TXT. Each record of this file consists of the following :

Student Name	15 characters
Student Id	4 digit integer
Student Height	real number;
Student Weight	real number;

Here is a sample contents of the input file.

```
THWALA D.M.   : 121210 1.59  70.5
BENNET L.A.   : 101055 1.80  80.4
BEATRIC S.P. : 132141 1.70  60.7
DVUBA M.      : 120740 1.92 100.2
SIBISI J.N.   : 120875 1.78  50.6
```

Using the JSP method, develop a pseudocode for a program that does the following

1. Reads in all the data from DATA.TXT

2. Computes the BMR (Body Mass Ratio) for each student and displays the information on standard output in the following layout –

```
                    UNIVERSITY OF SWAZILAND
          BODY MASS INDEX OF CS451 CLASS, JULY, 2008
============================================================
ID   NAME                  HEIGHT    WEIGHT    BMR     STATUS
============================================================
---- ---------------       -.--      ---.--    ---.--  ------
---- ---------------       -.--      ---.--    ---.--  ------
---- ---------------       -.--      ---.--    ---.--  ------
============================================================

SUMMARY
=======
TOTAL NUMBER OF STUDENTS        = ---
AVERAGE WEIGHT                  = ---.--
AVERAGE HEIGHT                  = -.--
COUNT OF HEALTHY STUDENTS       = ---
COUNT OF OBESSE STUDENTS        = ---
COUNT OF OVER WEIGHT STUDENTS   = ---
```

NOTES:

1. BMR is Weight divided by the square of height.
2. STATUS is HEALTHY if BMR lies between 20 to 25,
   STATUS is OBESSE if BMR is greater than 25 but less than 30.
   STATUS is OVERWEIGHT if BMR is greater than or equal to 30.
   STATUS is UNDER WEIGHT if BMR is less than 20.

The program works for any input data file (with similar format), containing any number of employees. Not just for the given data above. *25 marks*