University of Swaziland
Final Examination 2004/2005

Title of paper : *Software Engineering*

Course number : CS461/CS449 (I)

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 Store (MS&V).

(a) Draw a context diagram for 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 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 by 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 in good standing, 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 a 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, and 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

(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 3

(a) Describe the Rapid Application Development approach (RAD) to software

   development.   *5 marks*

(b) Describe the main difference between prototyping and incremental development.

                                                          5 marks

(c) Describe the three (3) major activities of requirements engineering. *3 marks*

(d) List and discuss four (4) quality requirements of a software requirements

   specification document.   *6 marks*

(e) List and discuss four (4) major drawbacks of using natural language for

   specifying requirements.   *6 marks*

3

Question 4

(a) Explain the general purpose of normalizing data stores. *5 marks*

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

DRUG CARD				
Patient # : 923		Surname : Dlamini	Initials : T.	
Ward #: 10		Ward Name : Maternity	Ward Capacity :20	
DRUGS PRESCRIBED				
Date	Drug Code	Drug Name	Dosage	Length of
				Treatment.
20-5-98	CO235	Cortisone	2 pills; 2 x day	14
20-5-98	MO341	Morphine	Injection ev 4 hrs	5
25-5-98	MO341	Morphine	Injection ev 3hrs	3
25-5-98	PE869	Penicillin	1 pill; 3 x day	7

Describe the data contained in the drug card for all the patients in *Unnormalized form, First normal form, Second normal form* and *Third normal form* relations. *20 marks*

Question 5

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

(b) Consider the following project schedule.

Activity	Predecessor	Duration (days)	Cost (E/ day)
A	NONE	5	E140
B	NONE	9	E150
C	NONE	4	E50
D	A	3	E40
E	B	8	E105
F	C	6	E60
G	D	13	E90
H	E	17	E110
I	E	11	E80
J	G	14	E70
K	D	3	E130
L	F,I,J	2	E75
M	K,H,L	7	E250

(i) Draw a Gantt chart for above project plan.   *6 marks*
(ii) Draw a PERT diagram for above project plan.   *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 is the additional cost to the project if task F was delayed by 20 days? *3 marks*

Question 6

(a) Explain the notions of cohesion and coupling.   *4 marks*

(b) What is the essence of information hiding?   *4 marks*

(c) Explain how coupling, cohesion and information hiding are interrelated design principles?   *6 marks*

(d) Draw a decision tree & table for the following admission policy problem. *11 marks*

Assume the admission fee to a nature reserve is determined as follows.

A child under 3 years of age is not to be charged an admission fee. A person under 18 years is to be charged half of the full admission fee. However if a child under 12 years is accompanied by an adult then the charge is a quarter of the full admission fee. For persons over 18 years, a full admission fee is to be charged except for students who are to be charged half the full admission fee and senior citizens (over 60) who are to be charged a quarter of the full admission fee. A 10% discount applies to all persons subject to full admission charge, who are members of a party of 10 or more. Finally, there are no student concessions on weekends.