University of Swaziland

Supplementary Examination 2005/2006

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*

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Question 1 - compulsory

Described below is the operation of *Good People Video Library Club (GVLC)*

(a) Draw a context diagram for *Good People Video Library Club (GVLC.* *5 marks*

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

Good People Video Library Club

The Good People Video Library Club (GVLC) specializes in obscure videos that are not readily available from other sources. GVLC lends only to members of the Video Society, part of an exclusive and very desirable Good People's Club. Any member of the club is automatically a member of the library club. Club membership is for one year; a few new members are admitted on 1 January each year. New members are not admitted during the year. A club membership secretary is responsible for admitting new members and corresponding with the membership in general.

The library is set up along conventional lines, though members are not restricted as to the number of videos they may borrow at any one time. Videos are requested for return only if required by another member. Most active users of the library club regularly change their videos. Two (2) or three (3) copies of popular titles are available.

In order to borrow a video, a member selects it, takes it to the issue desk and gives the video and his club membership card to the librarian. The librarian takes the video card, from the video sleeve, and adds the membership number to the card. The librarian then places the video card into the loans file and the member leaves with the video.

When a member returns a video, he or she presents the video to the librarian. The librarian finds the video card in the loans file and places the card in the video sleeve before returning the video to the library shelves.

To reserve a video that is on loan, a member asks the librarian and leaves his/her membership number. The librarian finds the relevant video card in the loans files and

2

adds the member's number on the reservation column on the video card. The librarian also makes a note of the member who has the video on loan and completes a return request card addressed to that member. The address is taken from the library copy of the club membership book. When the reserved video is returned, the librarian puts the video on the reservations shelf and completes a reservation ready card addressed to the first member who requested the reservation, again taking the address from the membership book.

Members make many inquiries of the librarian. Typical questions include: Is the video entitled The Gods must be crazy available? Which videos did actor Tom Cruise appear in? Do we have a video entitled Dead man walking? Do we have any videos on the subject of Human rights?

The librarian is able to answer these queries by inspecting the loans file, the actor index, the title index and subject index. In addition to the above duties, the librarian receives new videos from the social committee of the club whose chairperson is the club membership secretary. On receipt of a new video, the librarian has to make out a video card for insertion into the video sleeve and make the relevant entries into the indexes. The librarians are also responsible for house keeping: Like amending the library copy of the club membership with changes of address and, at the end of each year, collecting the new membership book from the Club membership secretary. Occasionally the librarian also takes out damaged videos and sells off very old videos to interested members or non-members.

Question 2

Based on the description of Good People Video library club and the DFD obtained in question 1 above,

(a) Identify two (2) entities and draw their entity life history diagrams. *10 marks*

(b) Draw an entity life history matrix for GVLC. *15 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*

Question 4

(a) Using Armstrong's axioms, state and prove the correctness of the following rule.

    (i)   Union rule   *5 marks*

    (ii)   Pseudo-transitivity rule   *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. *15 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.   *2 marks*

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

(c) Explain how coupling, cohesion and information hiding are interrelated design principles?   *4 marks*

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

15 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.