

University of Swaziland

Department of Computer Science

Final 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

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.

Question 2

- 1) What is an ER model used for? [2]
- 2) Describe the two activities that involve using an ER model. [2]
- 3)

Good People Video Library Club (GVLC)

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 the 1st of 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 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.

Draw an ER model for Good People's Video Library Club (GVLC). [14]

- 4) Define functional dependency. Give an example. [3]
- 5) A normalized data store may either be in 1NF, 2NF or 3NF. Define each of these normal forms. [3]
- 6) What is a non-key dependency? [1]

Question 3

- 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)

Manzini hospital x-ray management system

Patients present X-ray request forms, obtained from their doctors, to the receptionist. The receptionist receives each form and produces an appointment card which is given to the patient. This card contains information such as patient particulars and the time and date on which the patient may come for the X-ray. The X-ray request forms are filed for later reference. The receptionist also keeps a diary of all the appointments. When patients arrive for X-rays on the appointed date and time, they produce their appointment cards. A nurse checks the validity of the card and passes the appointment card to the clerk. The clerk generates an x-ray film-and-report request form for the filing section. The X-ray request form is retrieved from its file and given to the radiographer. The X-ray film-and-report requests are placed in a temporary file for collection by the filing section.

On receipt of the X-ray request form, the radiographer takes the appropriate photographs (called films) and places them on a temporary file for collection by the filing section. Each appointment results in a set of films.

The filing clerks collect the X-ray film-and-report requests. A patient may have many X-ray films and reports, the new films are attached and placed on a temporary file for the attention of the radiologist who will make out a report for the appointment.

The radiologist examines all the X-ray films and reports what the patient has and produces a final report which is sent to the patient's doctor. A copy of this report is also sent to the filing section. When the filing section receives this report all corresponding films and reports are returned to the permanent files.

For the above X-ray system develop the following:

- Physical DFD [9]
- Logical DFD [8]

SECTION B

Question 4

- 1) State and describe the six (6) required properties of a software system. [6]
- 2) The Requirements Analysis (RA) phase consists of two main activities --- Analysis and Specification. Clearly describe these two activities, making the distinction between them clear. [4]
- 3) Describe eight (8) activities that may be included in the design phase. [8]
- 4) A project plan has thirteen (13) important constituents. Name and describe any two (2). [2]

Question 5

Activity ID	Description of Activity	Predecessor	Duration (Months)
XX1	Contract signing	None	1
XX2	First consultations	XX1	2
XX3	Team hiring	XX1	3
XX4	OSD discussion	XX2, XX3	2
XX5	Modules splitting	XX4	3
XX6	Assignments	XX5	2
XX7	Start documentation	XX4	1
XX8	Module development 1	XX6	2
XX9	Module development 2	XX6	3
XX10	Module development 3	XX6	2
XX11	Integration	XX8, XX9, XX10	2
XX12	Test	XX8, XX9, XX10	3
XX13	Final integration	XX11, XX12	2

XX14	Final test	XX13	2
XX15	Final documentation	XX7, XX14	3

- 1) Produce a Gantt chart and a PERT diagram for the above project schedule. [12]
- 2) What is the earliest completion time for the project? [3]
- 3) What is the critical path for the project? [2]
- 4) Would it affect the project in anyway if task XX8 was delayed by 2 months? If so, how? [3]

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