

University of Swaziland

Department of Computer Science

Final Examination

2009/10

Title of Paper: Software Engineering I

Course Number: CS451/461

Time Allowed: Three (3) hours

Instructions: 1) This paper has five (5) questions and each carries 25 marks.

*2) Section A is **COMPULSORY**.*

3) Answer any two (2) questions in Section B.

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

SECTION A (COMPULSORY)

Question 1

- a) Define the term Software Engineering? [3 marks]
- b) What is a Software System? Give an example. [3 marks]
- c) List the 5 major phases of the Software Life Cycle. [5 marks]
- d) What are the four kinds of maintenance activity? [4 marks]
- e) What is the difference between verification and validation? [5 marks]
- f) How many activities are there in the requirements analysis phase? Name them and discuss them briefly? [5 marks]

Question 2

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 dependants, 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. [5 marks]
- b) Draw a top-level (level 1) logical data flow diagram (DFD) for the Payroll System.

[20 marks]

SECTION B

Question 3

- a) List any six constituents of a project plan. [6 marks]
- b) Define the following, giving appropriate examples:
- i) Project risks [2 marks]
 - ii) Product risks [2 marks]
 - iii) Business risks [2 marks]
- c) Consider the following project schedule.

Task (Activity)	Duration (days)	Start date	End date	Cost per day (Emalangeni)	Predecessor
A	3	20 may	22 may	100	-
B	4	20 may	23 may	75	-
C	8	23 may	30 may	90	A
D	5	23 may	27 may	20	A
E	6	24 may	29 may	42	B
F	3	30 may	1 june	56	D, E
G	4	24 may	27 may	30	B
H	7	2 june	8 june	55	C, F

- i) Draw the Gantt chart for the above project plan. [5 marks]
- ii) Draw the PERT diagram for the above project. [5 marks]
- iii) Assuming that all tasks are completed in the allocated time, what is the earliest completion time (ECT) for this project? [2 marks]
- iv) What is the critical path of the project? [1 mark]

Question 4

- a) Using the description below draw the following:
- i) Decision tree [8 marks]
 - ii) Decision table [7 marks]

A child under 3 years of age is not to be charged an admission fee. A person 18 years and below 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.

- b) What is prototyping? Discuss the different ways in which it can be used. Give the advantages and benefits of prototyping. [10 marks]

Question 5

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, and 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.

- a) Based on the above requirements, construct an E-R diagram for the community library database. [9 marks]
- b) What is the general purpose of normalizing data stores? [2 marks]
- c) 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) [14 marks]

The End!!