

University of Swaziland

Department of Computer Science

Supplementary Examination

2010/11

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 following:

- Logical Cohesion [4 marks]
- Sequential Cohesion [4 marks]
- Communicational Cohesion [4 marks]
- Procedural Cohesion [4 marks]
- Coincidental Cohesion [4 marks]

b) Name the five types of coupling. [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) Discuss the main contents of a project plan. [5 marks]

(b) Consider the following project schedule.

The following table represents the time and cost estimates for a software development project.

| Task | Predecessor | Duration (days) | Daily cost (Emalangen) |
|------|-------------|-----------------|------------------------|
| A | NONE | 4 | 200 |
| B | A | 6 | 300 |
| C | B | 5 | 150 |
| D | K, G, C, N | 4 | 1000 |
| E | A | 2 | 170 |
| F | E | 4 | 240 |
| G | F | 4 | 300 |
| H | NONE | 3 | 1400 |
| J | H, E | 2 | 200 |
| K | J | 3 | 550 |
| L | A | 2 | 1100 |
| M | B | 2 | 600 |
| N | M | 4 | 1800 |
| P | M | 3 | 700 |
| Q | P | 4 | 600 |

- (i) Represent the information in table above using a Gantt chart. [5 marks]
- (ii) Represent the information in table above using a PERT diagram. [5 marks]
- (iii) What is the earliest completion time of the project? [2 marks]
- (iv) What is the critical path for the project [2 marks]

- (v) What is the additional cost to the project if task H is delayed by seven (7) days? [3 marks]
- (vi) What is the additional cost to the project if task A is delayed by one (1) day? [3 marks]

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) A company sells its kitchenware products by means of a team of salespersons who organize kitchenware parties in their customer's houses. Products are supplied to customers from the nearest warehouse. A salesperson may have several warehouses in their sales area. The company keeps records of the total value of sales for each salesperson. For example

| | | | | |
|--------------------------------|----------------------|-----------------------------|---------------------------|--------------------|
| Salesperson number: 245 | | Name : Musa Gule | | |
| Telephone : 55100 | | Sales Area : Manzini | | |
| Customer Number | Customer Name | Warehouse Number | Warehouse Location | Total sales |
| | | | | |
| 101456 | Mamba | 12 | Matsapa | 5000 |
| 256366 | Zulu | 26 | Simunye | 300.13 |
| 424242 | Lwandle | 64 | Matsapa | 647.99 |

Describe the data described above in *Un-normalized form*, *First normal form*, *Second normal form* and *third normal form* relations. [14 marks]

The End!!