

University of Swaziland
Department of Computer Science

Final Examination

May 2008

Title of paper : Software Engineering I

Course number : CS451/CS461

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 *Payroll System for J.D (Pty) Ltd*

(a) Draw a context diagram for Payroll System

5 marks

(b) Draw a top-level (level 1) logical data flow diagram for Payroll System.

20 marks

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 departmental 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 summarised 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.

Question 2

- (a) Define the term software engineering? *2 marks*
- (b) What are the essential characteristics of software engineering? *5 marks*
- (c) Discuss four kinds of maintenance activity. *4 marks*
- (d) What are the three major types of requirements engineering? *5 marks*
- (e) List and discuss the major quality requirements for a requirements specification document. *5 marks*
- (f) List and discuss major drawbacks of using natural language for specifying requirements. *4 marks*

Question 3

- (a) Explain why the intangibility of software systems poses special problems for software project management. *5 marks*
- (b) Distinguish between project risks, product risks and business risks. Give examples. *6 marks*
- (c) Consider the following project schedule.

Task	Duration (days)	Depends on
T1	8	NONE
T2	15	NONE
T3	15	T1
T4	10	NONE
T5	10	T2,T4
T6	5	T1,T2
T7	20	T1
T8	25	T4
T9	15	T3, T6
T10	15	T5, T7
T11	7	T9
T12	10	T11

- (i) Draw a Gantt chart for above project schedule. *5 marks*
- (ii) Draw a PERT diagram for above project schedule. *5 marks*
- (iii) What is the earliest completion time for the project? *1 mark*
- (iv) What is the critical path of the project? *1 mark*
- (v) What would happen to the project if task T3 was delayed by 5 days? *2 marks*

Question 4

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.

- a) Draw a decision tree for the decision problem as explained above.
- b) Draw a decision table for the decision problem as explained above.

12 Marks

13 Marks

Question 5

(a)

"Software Engineering is a field in which members of one culture create artifacts on behalf of members of another culture". Discuss the significance and extent of this assertion, noting its particular challenges and how these challenges can be managed.

7 marks

(b) Discuss the role of prototyping in software development, making particular reference to the different ways in which it may be used. Explain some of the advantages and disadvantages of prototyping.

10 marks

(c) Data Flow Modeling depends on a number of complementary techniques to completely describe a software system. Briefly describe (narrative) these techniques, explaining how they complement data flow modeling.

8 marks

Question 6

Use the JSP method to develop a program for the problem defined below. *Show all the steps.*

Consider an input data file, **Employee.txt**, containing employee names and a record of hours worked by each employee. Assume the file has the following format.

```
Dlamini Musa : 3 4.5 2 1.75
Chunga Jason : 3.8 5.9 9.6 6.7 8.5
Zulu Kenneth : 2 3.25 8.5 9.25 4.5 1.5
Turner David : 1.5 2
```

Write Pascal program that reads data from the input file and produces a table of three(3) columns: *employee name*, *Total hours worked*, and *Gross Pay* for each employee. *In the output table, the employee names must be sorted in Alphabetical order.*

Assume employees are paid a normal rate of E2.50 per hour for the first 20 hours worked. The remaining hours are treated as overtime and paid at double the normal rate. The program also output the maximum and minimum number of hours worked, the maximum and minimum gross pay and the total amount paid to all employees.

For the above example file the program produces the following table.

Employee	Hours Worked	Gross Pay (E)
Chunga Jason	34.50	E122.5
Dlamini Musa	11.25	E28.13
Turner David	3.50	E8.75
Zulu Kenneth	29.00	E95.00

Maximum hours worked = 34.50
Minimum hours worked = 3.50

Maximum Gross Pay = E122.50
Minimum Gross Pay = E8.75

Total amount paid = E254.38

The program works for any input data file (with similar format), containing any number of employees. Not just for the given data above.