

University of Swaziland
Final 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 any Four (4) questions from questions 1 to 6***

This paper may not be opened until permission has been granted by the invigilator

Question 1

Described below is an X-ray management system for a hospital in Manzini.

(a) Draw a context diagram for the X-ray management system. *5 marks*

(b) Draw a top-level (level 1) logical data flow diagram for the X-ray management system. *20 marks*

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 which 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.

Question 2

- (a) Define the term Software Engineering. *5 marks*
- (b) What are the major phases of the software development process. *5 marks*
- (c) What is the difference between verification and validation. *5 marks*
- (d) Define four kinds of maintenance activity. *5 marks*
- (e) Why is the documentation of a software project important? *5 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) Explain the general purpose of normalizing data stores.

5 marks

(b) 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	Iwandle	64	Matsapa	647.99

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

20 marks

Question 5

(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 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.

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)
Dlamini Musa	11.25	E28.13
Chunga Jason	34.50	E122.5
Zulu Kenneth	29.00	E95.00
Turner David	3.50	E8.75

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.

25 marks