

University of Swaziland
Department of Computer Science

Supplementary Examination

July 2013

Title of paper : Software Engineering I

Course number : CS451

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

Case study

(Questions 1 is based on the following descriptive case study)

The Strontium 90 (TS90) Health Club

The Strontium 90 Gym has a paper method of maintaining its records that it now realizes will not do with its high enrolment and the low cost of modern day technology. Tong Liu has been hired as their system consultant to see what needs to be done to computerise their system. After a series of interviews with key personnel in Strontium 90, he has found out that their paper processing system works as follows.

Prospective members come in person, either as guests of a member or via promotions in the newspaper. If they decide to join the club, they fill out a membership application. Louisa Beau body takes their application and places it in a folder which she files by members last name. She also fills out a membership card which she gives to the new member and then creates a member-on-file card. The member-on-file card goes into a cardfile that is kept at the Health Club's entrance. If a member forgets their membership card, all they need to do is show another form of id. The person at the reception desk will check the member-on-file cardbox. If a match is found, the individual is permitted entrance. The member-on-file card also lists the nature of the membership, i.e., whether free exercise clothes, lessons or massages are included in the membership.

At the beginning of every month Louisa Beaubody goes through the files and pulls out those members whose membership is about to expire within two months. She generates an automatic form letter on her electronic typewriter to send to these individuals and encloses a renewal card in her mailing. She also pulls out the files of all the memberships that have expired, pulls out their member-on-file card and throws both in the trash.

Question 1 - compulsory

- (a) Draw a context diagram for TS90 Health Club.. *5 marks*
- (b) Draw a physical data flow diagram for the TS90 Health Club. *10 marks*
- (c) Draw a top-level (level 1) logical data flow diagram for the TS90 Health Club. *10 marks*

Question 2

Based on the mini project you did for your continuous assessment,

- (a) briefly discuss the different aspects of software project management. 5 marks
- (b) Briefly discuss the strength and weaknesses of the following methodologies.
- i. waterfall model 5 marks
 - ii. prototyping 5 marks
 - iii. Rapid Application Development 5 marks
- (c) Write brief notes on the role of Integrated Development Environments (IDEs). In your answer, give specific examples and clearly state the principles methodologies and IDEs you used in your mini project. 5 marks

Question 3

- (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) Write brief notes on *Scrum* and *Extreme Programming* 10 marks

Question 4

- (a) “*Software Engineering is a field in which members of one culture create artifacts on behalf of members of another culture*”. Discuss the truthfulness of this assertion and the particular challenges it poses in the software development process. 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 5

Consider a single **EMP_DEPT_PROJ** table with the following attributes.

ENO – refers to Employee Number
ENAME – refers to Employee name
DOB – refers to Employee date of birth
ADD – refers to Employee address
PNO – refers to the Project Number
PNAME – refers to the Project Name
PLOCATION – refers to the Project Location
DNO – refers to the departmental number
DNAME – refers to the Departmental Name
EmailID – refers to the Employees Email
DMGRNO – refers to the departmental Manager Numbers
Hours – refers to number of hours allocated to the project.

And the following set F of function dependencies exist in the above table:

$$F = \{ \begin{array}{l} \text{ENO,PNO} \rightarrow \text{DOB,ENAME,ADD,DNO,DNAME,DMGRNO,} \\ \quad \text{PNAME,PLOCATION,EmailID,Hours,} \\ \text{ENO} \rightarrow \text{DOB,ENAME,ADD,DNO,DNAME,DMGRNO,EmailID,} \\ \text{PNO} \rightarrow \text{PNAME,PLOCATION,} \\ \text{DNO} \rightarrow \text{DNAME,DMGRNO,} \\ \text{ENO} \rightarrow \text{EmailID,} \\ \text{EmailID} \rightarrow \text{ENO} \end{array} \}$$

- (a) Explain the meaning of the term **closure of F**. *1 marks*
- (b) Demonstrate your understanding of the basic armstrong's rules and the additional rules by listing six rules that are in the closure of F given above. Your answer must demonstrate your understanding of all the rules. *9 marks*
- (c) Decompose the table into third normal form tables. Show that each decomposition is lossless and dependency preserving *15 marks*

Question 6

(a) List and Explain five (5) dimensions along which a software development project has to be controlled. *5 marks*

(b) Describe the main difference between throw-away prototyping and evolutionary prototyping. *3 marks*

(c) Discuss the main contents of a project plan. *3 marks*

(d) Consider the following project schedule.

Description	Activity	Predecessor	Duration (days)	Cost (E/ day)
Develop plan for adverts.	A	NONE	5	1000
Design promotion plan.	B	NONE	2	700
Develop training plan.	C	NONE	2	800
Schedule radio and T.V. adverts.	D	A	4	500
Prepare adverts.	E	A	8	800
Prepare material for promotion.	F	B	3	600
Prepare manual for training.	G	B	5	600
Conduct pre-introduction campaign	H	D	4	400
Screen and select managers.	I	C	8	800
Conduct training program	J	B & I	3	1000
Introduce system	K	E & F	4	1200
Evaluate system	L	H & J & K	3	1000

(i) Draw a Gantt chart for above project plan. *5 marks*

(ii) Draw a PERT diagram for above project plan. *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 is the additional cost to the project if task C was delayed by 5 days? *2 marks*