

University of Swaziland
Department of Computer Science

Final Examination
December 2011

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 and 2 are based on the following descriptive case study)

Lozindonga Sales Department

A customer may contact the department over the telephone or by fax or post. If the customer is requesting a quote for an order, the Sales Administrator will complete a Contact Sheet. The contact sheet contains the name and address of the customer, along with the products the customer wishes to be quoted for. Sometimes the customer knows the product number of the products, especially if the customer has placed regular orders previously, but often, a description of the product required is all that is provided.

The contact sheet is then passed to the Purchasing department for them to fill in the purchase price, expected delivery date and any missing product numbers. The member of staff who completed the form must date the Contact form before returning it to the Sales Administrator.

Once the completed Contact Sheet is returned to the Sales Administrator, a quote is written, detailing the product number, description, quantity, price and Expected Delivery Date for each product, total price and any special requirements. The sales price on the quote is always 30% higher than the purchase price provided on the contact sheet. The original quote is then sent to the customer and a copy is placed on file. It is usually expected that a customer request will be quoted within five working days .

A customer must send an order in by post or fax, to provide a signature. An order may be as detailed as it's quote or very brief indeed. Every order must have been preceded by a quote, since product availability, prices and delivery times vary from week to week. The original quote corresponding to the customer's order must be found by searching through the quote file. If the corresponding quote cannot be found, the order is returned to the customer.

Once the corresponding quote has been found, an order acknowledgement is sent to the customer and the date on which the order was received is written on the quote. The original Customer's order is then attached to the quote and filed away. A photocopy of the order and the quote is passed on to the Purchasing department who will process the order.

Although in most cases an order will list all the items listed on a quote, it is possible that the products listed on a quote will be ordered in two or more separate orders. In this case, the first order will be treated as any other order. When the second and subsequent orders are received an order acknowledgement is sent to the customer and the order is attached to the quote and previous orders, and filed. A copy of the quote and most recent order are then sent to the purchasing department and the quote is appended to show the date most recent order was received.

Once all products on an order have been delivered to the customer, the photocopy of the order and quote is passed back to the Sales Administrator from the Purchasing department. The order copy will have the actual date of delivery stamped on it. The Sales Administrator will write the Expected Delivery Date on the original order and throw away the copy.

Question 1 - compulsory

- (a) Draw a context diagram for Lozindonga Sales Department (LSD). 5 marks
- (b) Draw a physical data flow diagram for LSD. 8 marks
- (c) Draw a top-level (level 1) logical data flow diagram for LSD. 12 marks

Question 2

- (a) Draw an Entity Relationship Diagram for Lozindonga Sales Department (LSD). 15 marks
- (b) Write a data dictionary to accompany the Entity Relationship Diagram obtained in (a). 10 marks

Question 3

- (a) What is the general purpose of Normalization? 2 marks
- (b) Using Armstrong's axioms, state and prove the correctness of the **pseudo-transitivity rule**. 3 marks
- (c) Consider the following SALES ORDER CARD containing information about a customer sales order.

SALES ORDER				
Customer Number : 101		SalesOrderNumber : 405		
Customer Name : ABC Company		SalesOrderDate : 2/11/2011		
Customer Address : Lukhozi Street		ClerkNumber : 503		
Siteki, S400		ClerkName : Sam. Kunene		
Item Ordered	Description	Quantity	Unit Price	Total
3101010	Office Desk	10	E5,000	E50,000
3121201	Executive Chair	10	E2,000	E20,000
5111452	Computer	5	E3,000	E15,000
Order Total				E85,000

Describe the data contained in the sales order card in *Unnormalized form*, *First normal form*, *Second normal form* and *Third normal form* relations. Show all that each decomposition is lossless and dependency preserving 20 marks

Question 4

(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 incremental development and Rapid Application Development (RAD) *3 marks*

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

(d) Consider the following project schedule.

	Activity	Predecessor	Duration (days)	Cost (E/ day)
Develop plan for adverts.	A	NONE	2	1000
Design promotion plan.	B	NONE	2	700
Develop training plan.	C	NONE	2	800
Schedule radio and T.V. adverts.	D	A	3	500
Prepare adverts.	E	A	8	800
Prepare material for promotion.	F	B	7	600
Prepare manual for training.	G	B	5	600
Conduct pre-introduction campaign	H	D	4	400
Screen and select managers.	I	C	7	800
Conduct training program	J	G & 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*

Question 5

- (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 documentation of a software project important? *5 marks*

Question 6

- (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*