



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2007/2008

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING

SSE 214: SOFTWARE CONSTRUCTION

DATE: Wednesday 18th June, 2008

TIME: 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS

- (i) **Answer question 1 and any other 2 questions.**
- (ii) **Time 2 hours**

Question 1 (Compulsory)

- (a)
 - (i) What is software construction? Explain why the process is considered as a complex exercise. [4 marks]
 - (ii) Discuss why specification and programming languages are mathematical based. [4 marks]
- (b) What is a specification? Where does it fit into the software lifecycle? [4 marks]
- (c)
 - (i) Define the term problem complexity. [2 marks]
 - (ii) Differentiate between ill defined from wicked problems. [2 marks]
 - (iii) What is a programming language Grammar? Give example. [2 marks]
 - (iv) Discuss any four ways of dealing with complexity in software development. [4 marks]
- (d) Certain people are registered as user of a computer system. At any given time, some of these users are “logged-in” to the computer (there is no multiple log-in; a user is either logged-in or no). There is a limit (between 32 and 128) to the number of users logged-in at any time. There are two groups of user’s staff and customers.

Express the following statement using Z notations.

- i. All the currently logged-in users are staff.
- ii. There is more customer than staff users. [8 marks]

Question 2

- (a) Discuss any three characteristics of a good programming language compiler. [6 marks]
- (b) Outline a model-based formal specification for the back-end of a very simple online shopping system. The system should have as its state a sequence of items currently in the customer's "shopping cart". Each item has associated with it a unique identifier and a cost. The other details associated with an item are not of relevance to this specification. For simplicity, assume that the cost of an item is represented by a natural number (which could be zero). An item may occur multiple times in a customer's shopping cart. There should be operations to:
 - (i) Initialise the current customer's shopping cart so that it is empty.
 - (ii) Add an item to the current customer's shopping cart-the parameters specify the unique identifier of the item and the number of copies (one or more) of the item that are to be added to the shopping cart;
 - (iii) Produce the total cost of all the items currently in the customer's shopping cart. [14 marks]

Question 3

- (a) Outline the content of an SRS document. [6 marks]
- (b) With aid of a diagram discuss various phases of program compilation. [4 marks]
- (c) Discuss various functional units found in a very simple examination system. All students are required to take examinations in the same number of subjects. A student's overall mark is the average of the marks achieved in the subjects. [10 marks]

Question 4

- (a) Discuss user characteristics that should be considered while gathering requirements. [4 marks]
- (b) Discuss pre-condition and post-condition as used in specification. [4 marks]
- (c) What steps can be taken during the implementation of a software system to help ensure its eventual correctness. [4 marks]
- (d) Give reasons why formal methods have not been in massive use in software development. Discuss what could be done to change the situation. [8 marks]

Question 5

- (a) What is an abstract machine? Discuss its application in software construction. [3 marks]
- (b) Differentiate between software and system architecture. [4 marks]
- (c) List three types of software architecture pattern. [3 marks]
- (d) Give a complete Z specification document of a simple bank database, described as follows. You may assume that you are given a type CUSTOMER. A customer may have only one account and the database record only the balance (in Kshs) currently held in that account.

The following operations may be performed on the database:

- (i) Open an account for a new customer,
- (ii) Make a deposit in a customer's account,
- (iii) Make a withdrawal from a customer's account,
- (iv) Output the current balance for a given customer.

This bank is very strict: no customer is allowed to have a negative balance. Your specification should take account of this restriction. Appropriate use should be made of the structuring facilities provided by Z. [10 marks]

.....