UNIVERSITY OF LONDON

B.Sc. Examination 2008

For External Students

COMPUTING AND INFORMATION SYSTEMS

210 Software Engineering and Development

[Eastern]

Duration: 3 hours

Date and Time :   Wednesday 14 May 2008 : 10.00 – 1.00 pm

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* *Full marks will be awarded for complete answers to FOUR questions. Do not attempt more than FOUR questions on this paper.*

* A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics, text or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

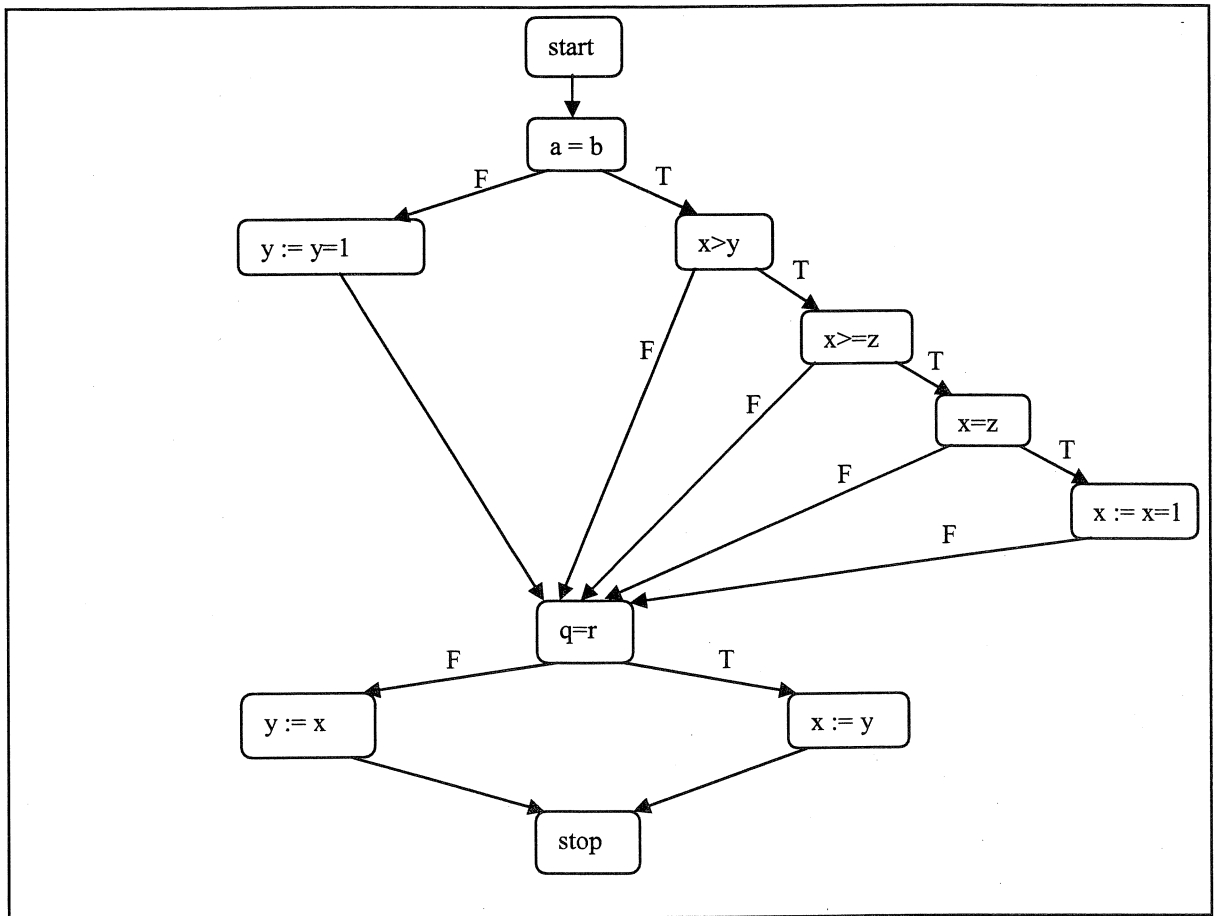## THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

Figure 1: A Control Flow Graph

Question 1.

(a) Briefly describe the difference between white box and black box testing, indicating the types of error that each is more capable of detecting.

[5]

(b) Consider the Control Flow Graph (CFG) depicted in Figure 1. The outgoing edges of predicates are labelled, T and F, to indicate which branch is taken for the **true** and **false** outcomes of the evaluation of the associated Boolean expression.

Design a minimal set of test data which achieves 100% statement coverage of this CFG. Write your answer in the form of the table shown in Figure 2 (below), where each row corresponds to a single test case and each column gives the initial value of each variable for each test case. (Note that in a correct answer there may be more rows than depicted in this figure; there may also be fewer rows. It is for you to decide when you have constructed a **minimal** test set.)

[10]

(c) Design a test set which is **minimal** and which achieves 100% branch coverage. Use the same format for your answer as you used for part b.

[10]

	p	q	a	b	x	y	z
Test input 1							
Test input 2							
Test input 3							

Figure 2: Format for answer

Question 2.

(a) Describe the principal features of a State Transition Diagram (STD). Explain how an STD can be used to describe a scenario during the development of a system.

[5]

(b) Draw an STD for the digital watch described below.

"The digital watch allows the user to set both the current time and the time at which the alarm will sound. It has several input buttons. These are labelled 'accept', 'cancel alarm', 'set time', 'set alarm', 'show alarm', 'increase' and 'decrease'. If the set time button is pressed the current time flashes and the user is allowed to change the time. This is done using the increase and decrease buttons, which (respectively) increase or decrease the displayed time by one minute. When the user is happy with the time they have selected, they press the accept button to return to normal working (in which the watch simply displays the current time).

To set the alarm, the user presses the set alarm button. The current time is shown flashing, and this also becomes the current alarm time. The user can then increase or decrease this current alarm time using the increase and decrease buttons and, when happy, selects the accept button.

In normal display mode there are two other options open to the user: 'cancel alarm' which cancels the currently set alarm (if there is one) and 'show alarm' which displays the currently set alarm (if there is one) until such a time as the accept button is pressed."

[20]

Question 3.

(a) Briefly describe the main features of a Booch Class Diagram.

[5]

(b) Draw a Booch class diagram, which describes the following situation. (You should add some accompanying text to explain the intention underlying your diagram and to indicate any assumptions you make about the situation described below.)

"A bank wants to store information about its customers and workers. A bank account can be either a current account, which attracts no interest, or a deposit account which attracts interest at a rate determined by the current balance. Each bank account may have up to three signatories and is held at a specified branch.

Each branch has a manager, who is an employee and who is not permitted to hold an account at the branch he or she manages (though all employees are automatically given bank accounts at some branch or other in order to encourage them to use the bank).

Employees may be employed either part time or full time, but managers are drawn exclusively from the full time staff."

[20]

Question 4.

(a) Explain the statement "High coupling is undesirable in a software system". Why is some level of coupling unavoidable?

[5]

(b) Define the seven levels of cohesion that one or more modules of a software system might exhibit. Give a simple example in pseudo code that illustrates each level of cohesion.

[14]

(c) Explain the difference(s) and similarity (or similarities) between stamp coupling and data coupling, with an example, written in pseudo code.

[6]

Question 5.

(a) It is often said that "people issues outweigh technical issues" in software engineering projects. Give two examples of problems that can arise from the "people issues" involved in a software development project, explaining the way in which they can cause software faults.

[6|

(b) A software project manager has decided to employ the FAST (Facilitated Application Specification Technique) in a software development project. What is the principal problem that the FAST technique seeks to address?

[2]

(c) Explain the way in which the FAST technique addresses the problems that can occur during specification of a software system.

[10]

(d) Briefly describe two causes of software faults which the FAST technique could not solve.

[4]

(e) Brookes' law states: "adding more people to a late project makes it later". Briefly explain the reasoning behind this law.

[3]

Question 6.

(a) Briefly describe three aspects of the software testing process that could be supported by the use of a CASE tool.

[3]

(b) Describe four different kinds of CASE tool, each of which can be applied to a different phase of the software development life cycle (SDLC). For each example tool explain one way in which it will be able to automate tasks which have to be performed during this phase and one aspect of the phase of the SDLC which cannot be automated.

[20]

(c) What is a Meta CASE tool?

[2]

END OF EXAMINATION