

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2011

Computer Science

IS50001B FOUNDATIONS OF PROBLEM SOLVING
AND PROGRAMMING

Duration: 3 hours

Date and time:

There are three questions in this paper. You should answer all of them. Each question is marked out of 100. The marks for each part of a question are indicated at the end of the part in [.] brackets.

No calculators should be used.

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

Question 1

- (a) Explain why it is important to write comments in your code. [10]
- (b) Describe and compare the data structure and data flow methods of problem modelling. [10]
- (c) Describe and compare top down and bottom up problem solving. Use diagrams if necessary. [10]
- (d) What is module cohesion? How does object oriented programming encourage module cohesion? [10]
- (e) Explain how call by value and call by reference affect module coupling. [10]
- (f) What is a data dictionary and how can it aid in analysing module coupling? [10]
- (g) Define black box and white box testing. Give examples of each type of testing. [10]
- (h) Give an example of a state transition that happens in a piece of software you use regularly. How might you test this transition? [10]
- (i) What is the purpose of a 'Requirements' document? [10]
- (j) Why is binary search typically faster than linear search? [10]

Question 2

- (a) Create a flowchart for an algorithm which reverses the order of the elements in an array. Add a key for the shapes you use. [50]
- (b) A car insurance company needs to decide if it should insure a driver and if so, how much it should charge. There are three outcomes here: do not insure, insure at standard rate, insure at high rate. The rules are as follows:
- i. If the driver is under 21 and has made a claim in the last 6 months, do not insure.
 - ii. If the driver has made a claim in the last 6 months and is 21 or over, insure at the high rate.
 - iii. If the driver is 21 or over and has never made a claim, insure at the standard rate.
 - iv. If the driver is under 21 but has never made a claim, insure at the high rate.
- Create a decision table that defines the input and output states for this problem. [50]

Question 3

The following questions are based on the following array:

4 1 17 12 3 12

- (a) A bubble sort is defined as follows:

‘Sort by comparing each adjacent pair of items in a list in turn, swapping the items if necessary, and repeating the pass through the list until no swaps are done’

From Paul E. Black, ‘bubble sort’, in Dictionary of Algorithms and Data Structures [online], Paul E. Black, ed., U.S. National Institute of Standards and Technology. 24 August 2009.

Showing your working, run the bubble sort algorithm on this array to determine how many swaps it will take to sort the array. [50]

- (b) A selection sort is defined as follows:

‘A sort algorithm that repeatedly looks through remaining items to find the least one and moves it to its final location.’

Paul E. Black, “selection sort”, in Dictionary of Algorithms and Data Structures [online], Paul E. Black, ed., U.S. National Institute of Standards and Technology. 24 August 2009.

Showing your working, run the selection sort algorithm on the array to determine how many elements will need to be moved to sort the array. [50]