UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2010

Computing Foundation

IS50001B (FY05)   Foundations of Problem Solving and Programming

Duration: 3 hours

Date and time:

There are four questions in this paper. You should answer no more than three questions. Full marks will be awarded for complete answers to a total of three questions. Each question carries 25 marks. The marks for the individual parts of a question are indicated at the end of the part in [.] brackets.

THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM

Question 1   Creating flow charts to calculate student marks

The marks for a course are assigned as follows:

  i. 4 course works, worth 15% each
 ii. 1 presentation, worth 10%
iii. 1 exam, worth 30%.

The rules for assigning grades are as follows:

   i. Overall score less than 35%: fail
  ii. Overall score between 35 and 40%: E
 iii. Overall score between 41 and 50%: D
  iv. Overall score between 51 and 60%: C
   v. Overall score between 61 and 70%: B
  vi. Overall score between 71 and 100%: A

(a) Create a flow chart which calculates the overall percentage mark gained by a student. The inputs are the percentage marks gained for each of the assessments, each out of 100. The output is the overall percentage mark, out of 100. Use the appropriate symbols to read and process the inputs and to calculate the output.   [10]

(b) Create a flow chart which calculates the grade achieved by a student, where the input is an overall mark out of 100 and the output is the correct grade for that mark.   [10]

(c) Create a module coupling diagram which shows the different modules you would use to solve the student grades problem above and how data is shared between these modules.   [5]

Question 2   Decision tables and testing

A travel company has various ways of charging its customers for holidays. Depending on the way the customer books their tickets, different discounts are applied. Only two discounts can be applied per holiday. The largest available discount(s) will be applied. The discounts are as follows:

  i. If they book on-line, they receive a 5% discount.

 ii. If they book a flight and a hotel at the same time, they receive a 10% discount.

iii. If they spend between £500 and £999, they receive a 15% discount.

 iv. If they spend more than £1000, they receive a 20% discount.

(a) Create a decision table representing the decisions involved in the above problem along with their results.   [15]

(b) Define several test cases for your system. See if you can apply testing techniques to reduce the number of tests required. Where possible, state which testing technique you used to reduce the number of tests.   [10]

Question 3   Sorting algorithms

(a) Briefly discuss the criteria you would use when choosing a sorting algorithm.   [5]

In these questions, you will be discussing the following array:

60	42	61	9	14	1

(b) 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.

Show how the array would be sorted by a bubble sort by showing the position of the elements in the array each time a swap occurs in the sort.   [10]

(c) 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'

From 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.

Show how the array would be sorted by a selection sort by showing the position of the elements in the array each time a swap occurs in the sort.   [10]

Question 4   Search algorithms

(a) Write pseudo-code representing the binary search algorithm.   [15]

(b) Given the following input array, describe the series of steps the binary search
algorithm would take to find the number 42.   [10]

1	9	15	16	41	42	60	61	75