UNIVERSITY OF LONDON

IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1999

BEng Honours Degree in Computing Part II
MEng Honours Degrees in Computing Part II
BSc Honours Degree in Mathematics and Computer Science Part II
MSci Honours Degree in Mathematics and Computer Science Part II
for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the
Associateship of the Royal College of Science
Associateship of the City and Guilds of London Institute

PAPER 2.7 / MC 2.7

SOFTWARE ENGINEERING – DESIGN II

Monday, May 10th 1999, 2.00 – 3.30

Answer THREE questions

For admin. only:
paper contains 4 questions

Section A *(Use a separate answer book for this Section)*

1 Consider the following simplified description of electronic gates:

i) All gates have a state, which is ON or OFF.

ii) A gate is either a source or a binary gate. A binary gate is either a conjunction gate or a disjunction gate.

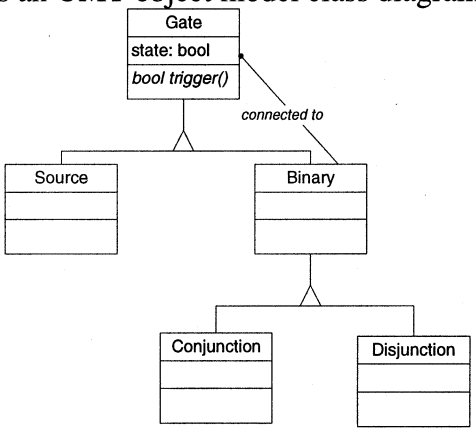
iii) The state of a gate may be set to ON or reset to OFF. The state of every newly created gate is implicitly OFF.

iv) A binary gate has two input pins, each of which may be connected to another gate.

vi) A source gate may be triggered to evaluate its state. In such a case it delays for 3 seconds, and then returns its state.

vii) When a binary gate is triggered, it delays for 3 seconds, and then it evaluates its state: A conjunction gate becomes ON if the state of both gates connected with its input pins is ON, otherwise it is OFF. A disjunction gate becomes ON if the state of either gate connected with its input pins is ON, otherwise it is OFF.

The following diagram is an OMT object model class diagram for electronic gates:



a) Develop classes (with their method bodies) to simulate electronic gates.

For the delay, assume that there exists a class `Delay`, with the method

```
void waitForSeconds(int secs)
```

which suspends evaluation for `secs` seconds.

b) Write a main function, where there is the circuit consisting of

i) two sources S1, S2;

ii) two conjunction gates A1, A2;

iii) one disjunction gate O1;

iv) the input pins of A1 are connected to S1 and S2;

v) the input pins of O1 are connected toS2 and A1;

vi) the input pins of A2 are connected to S1 and O1;

vii) S2 is set, A1 is reset, S1 is reset, O1 is set;

viii) A2 is triggered.

The two parts carry, respectively, 70% and 30% of the marks.

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2 Consider the following simplified description of traffic lights controlling crossroads:

i) Traffic lights exist in pairs of collaborating lights, ie one controlling the north-south direction and the other controlling the west-east direction. Traffic lights contain two lamps, one red and one green.

ii) Each lamp has a colour, and may be turned off or on.

iii) A traffic light is notified when a car wants to cross in the direction controlled by it.

iv) When a traffic light receives the message that a car wants to cross in the direction *it* is controlling, then if it has red colour it will request the collaborating light to turn to red. Otherwise, it will do nothing.

v) When a traffic light is requested to turn to red, then

If it has green colour, then it will delay and then it will turn its red lamp on, its green lamp of, and require the collaborating light to turn to green.

If it has red colour, it will do nothing.

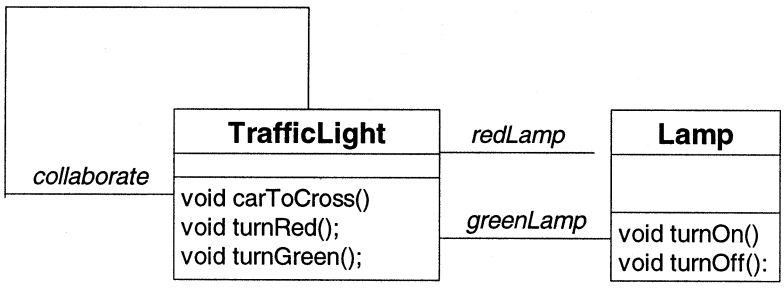
vi) When a traffic light is requested to turn to green, then:

If it has red colour, it will delay and then it will turn its green lamp on, its red lamp of, and require the collaborating light to turn to green

If it has green colour, it will do nothing.

vii) Traffic lights have their own delay time, which is set individually, and may change.

The following diagram is an OMT object model class diagram for traffic lights:



a Write Java classes (together with method bodies) that support the functions described in i) - vii). For the delay, assume that there exists a class `Delay`, with the method

```
void waitForSeconds(int secs)
```

which suspends evaluation for `secs` seconds.

b Write a test method in which:

i) There is a pair of traffic lights consisting of traffic light T1 with delay time `12`, and traffic light `T2` with delay time `5`.

ii) Notify T1 that a car wants to cross. Notify T2 that a car wants to cross.

iii) Set the delay time for T1 to `7`.

The two parts carry, respectively, 70% and 30% of the marks.

Turn over....

Section B *(Use a separate answer book for this Section)*

3a Briefly explain what is meant by usability, and give criteria by which it may be assessed.

b Briefly describe:

i) the process and focus of user-centred systems design,

ii) how user centred design contributes to usability,

iii) the benefits claimed, and the chief difficulties and problems.

c Briefly describe the processes and products available for evaluating an unimplemented design for a publically accessible web site of consumer price indexes.

d Suggest five guidelines for usability of a publically available web site.

Parts a, b, c and d carry, respectively, 20%, 30%, 25% and 25% of the marks.

4a Briefly explain the purpose of task analysis in user interface design, and how it contributes to dialogue design.

b Consider the overall task of searching for information about a book using a computer-based library information system. For example, searching for books by a certain author, on a specific topic, or querying the availability, or location, of a specific book. Draw:

i) a hierarchical task analysis diagram for the joint user and system task,

ii) a dialogue state and flow chart for the system.

c Briefly state one advantange and one disadvantage for each of the following dialog styles when used for the information gathering task considered in part a above:

i) form-filling,

ii) menus,

iii) a command language.

Hint: consider issues like the type of search, the information required, and the type of user.

Parts a, b and c carry respectively 20%, 50%, and 30% of the marks.

[End of Paper

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