UNIVERSITY OF LONDON
IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 2001

MEng Honours Degree in Information Systems Engineering Part IV
MSci Honours Degree in Mathematics and Computer Science Part IV
MEng Honours Degrees in Computing Part IV
MSc in Advanced Computing
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 City and Guilds of London Institute
This paper is also taken for the relevant examinations for the Associateship of the Royal College of Science

PAPER C475=I4.16

SOFTWARE ENGINEERING - ENVIRONMENTS

Wednesday 16 May 2001, 10:00
Duration: 120 minutes

Answer THREE questions

Paper contains 4 questions
Calculators not required

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

1a Traditional software engineering methods are not very successful for web development.

i) Briefly (in point form) explain why.

ii) A website is similar to a shop front. Justify this statement.

b The roles of different potential types users should be taken into account when designing a website. Briefly describe the ways user profiles should be taken into account when designing a website.

c Assume you are going to redesign the Department of Computing's website. Choose three types of users to profile who might use the site.

i) For each type of user what information would they like to get from the site?

ii) What kinds of computer resources are needed to provide each of the users with a successful visit?

iii) There are types of users of the *current* Department of Computing pages who find getting information from our pages less than straightforward. Name a type of user whose access could be improved on our existing website and describe the difficulties this type of user might encounter. What would you do to our existing site to make access more straightforward for this type of user to get the information they wish to have.

The three parts carry, respectively, 30%, 20% and 50% of the marks.

2a This question is about the extreme programming concept *refactoring*.

i) What is refactoring?

ii) Why is it important in the extreme programming methodology?

b You work for the XP software house Keep It Simple (K.I.S.) where all programming is done in Java. It has been decided that a refactoring browser for Java should be built.

This will be a development environment where a change can be chosen (either to the currently edited classes or to an entire program), implemented, and if the resultant code no longer behaves like the original code then the change will be undone.

For example, consider the change *move the chosen method m into the superclass of the class that contains m.* This could break code if there was already a different method m in the superclass that was being overridden by our method m, and that is called somewhere in the, somewhere in the project, an existing method

List five changes that you would like to have support for in the refactoring browser for Java and state when you might use each change. For each of your changes, state under what conditions it could break the program being altered.

c One of your colleagues says:

> *I know how to implement this. Java provides methods to access the abstract syntax tree and the open source IDE for Java holds programs as abstract syntax trees. So all we need is to use is the visitor pattern to automate the refactoring changes.*

What does this mean? Is this a sensible way to implement a refactoring browser for Java?

The three parts carry, respectively, 30%, 50% and 20% of the marks.

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

3a (i) Briefly distinguish between validation and verification (V&V), and explain their role in Requirements Engineering. Give one example of a validation technique and one of a verification technique.

b Suggest an approach for making the requirements statement below more testable:

"the Internet-banking system shall be secure"

Illustrate your answer by re-writing the requirement.

c As part of the planning process for the next general election, your consultancy firm, Requirements Engineers Do It Once (REDO Ltd), is hired to elicit the requirements for a fully automated, Internet-based presidential voting system.

Discuss your approach for eliciting the requirements for such a system, focusing on the kinds of information you need to elicit, and how you plan to elicit this information. Be specific about the kind of techniques you suggest, indicating the impact of your choices on the final system.

d Once you have elicited the requirements for the system described in part (c), you discover that the Macrohard Corporation has an existing product called Polling on the Internet Securely (P.I.S.) that addresses some of the functionality required. Briefly discuss the process by which you would decide whether to build a new system from scratch or to take the P.I.S. product and adapt it to your requirements.

The four parts carry, respectively, 20% 15%, 45%, and 20% of the marks.

4a Give two uses and two potential difficulties of prototyping in Requirements Engineering.

b What is requirements traceability, why is it useful, and why is it often not implemented in organisations?

c (i) Using a notation of your choosing, outline a use case that describes the process of ordering a burger at a fast food restaurant.

(ii) Suggest why the above use case is not usually considered a requirements specification. Briefly explain how the use case can be used to infer requirements, by distinguishing indicative and optative descriptions from the use case.

(iii) If you know of an existing automated system to support the ordering of sandwiches from a university canteen, suggest a role for problem frames in helping you develop a system for supporting the ordering of burgers from the fast food restaurant described in part (i).

d Why are requirements management tools generally insufficient to support the entire requirements engineering process?

The four parts carry, respectively, 20% 20%, 40%, and 20% of the marks.