UNIVERSITY OF LONDON
IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1998

MEng Honours Degrees in Computing Part IV
MEng Honours Degree in Information Systems Engineering Part IV
MSci Honours Degree in Mathematics and Computer Science Part IV
MSc Degree 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
Diploma of Membership of Imperial College
Associateship of the City and Guilds of London Institute
Associateship of the Royal College of Science

PAPER 4.75 / I4.16

SOFTWARE ENGINEERING - ENVIRONMENTS

Wednesday, May 6th 1998, 10.00 - 12.00

Answer THREE questions

For admin. only: paper contains 4 questions

Use a separate answer book for *each* question.

1 Many computer programs that deal with expiry dates for products use the string "9999" to stand for forever (no expiry date). These programs contain loops that process dates. The loops terminate when the date string is "9999". These programs were written without any consideration that 9 September 1999 is a real date.

a How do you start addressing the problem?

b How would you test a networked personal computer to see if any software on it had the 9999 problem?

c Give four conditions under which the code should be completely replaced.

d After finding the source code for all programs on a Unix system that had this problem, how might you fix the problem?

All parts carry equal marks.

2a Enumerate four essential activities of user interface design, and in a few sentences each explain what they contribute to the design overall.

b The London Ambulance Service dispatch system failed in 1992 partly because of the design of the in-cab terminals installed for the use of ambulance crews. Designed originally for secure delivery vehicles, each terminal included a one-line display and 20 buttons, and was mounted above the dashboard, connected to the control centre by radio. At high speeds, ambulance crew members often pressed the wrong button and conveyed misleading status information to the control centre. In fact only four buttons were needed to indicate changes in status.

Explain how you think this design failure may have come about, in terms of the essential activities of user interface design.

c What steps would you take to design a better terminal? Explain in particular how you would guard against usability problems.

The three parts carry, respectively 25%, 25% and 50% of the marks.

3 A long, long time ago, in a galaxy far, far away, there was a planet called Mental, remarkably similar to the planet Earth which we know and love so well. As a practical joke, some inhabitants of Earth decided to send - using the latest time-travel machine technology - the top student of the Software Engineering Environments course of 1997 to the planet Mental. Her mission: to impress the locals with her advanced software engineering skills and expertise.

At the time this took place, the Mental Space Agency (MENSA) was about to launch the fifth mission of its Ariane rocket - which, by sheer coincidence, had developed in an identical manner to the European Space Agency's Ariane programme on planet Earth.

You are the top student of the aforementioned course. Upon arrival at the MENSA software development headquarters, the director asks you to evaluate the software development programme of the Ariane 5 mission. Based on your previous analysis of the Ariane 5 failure report on planet Earth, you decide to focus on the five activities of the development process listed below. For each activity, outline briefly the potential problems that might cause the Ariane 5 mission to fail, and suggest a possible remedy for each problem.

i) programming
ii) design
iii) requirements
iv) testing
v) project management

All parts carry equal marks.

4a i) Give two reasons why requirements engineering is important.
ii) What is the role of prototypes in requirements engineering?

b With reference to the SEI Capability Maturity Model, discuss briefly at what level you think it is appropriate for an organisation to introduce a requirements management tool, such as DOORS, to its software development process.

c A software engineering lecturer is tired of spending hours every year thinking of new exam questions for his students. He decides to develop a software system that will help him generate exam questions on selected topics automatically. Do you think his requirements are feasible? Briefly justify your answer using examples of automated software development environments.

d The lecturer in part (c) has convinced his head of department that his idea is feasible. Name a requirements engineering approach that could assist the members of the department specify their collective requirements for such an exam question generation system, and briefly explain the basic concepts on which its is based.

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

End of paper