

UNIVERSITY OF LONDON
IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1997

MEng Honours Degrees in Computing Part IV
MEng Honours Degree in Information Systems Engineering 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*

PAPER 4.75 / I4.16

SOFTWARE ENGINEERING - ENVIRONMENTS

Wednesday, April 30th 1997, 10.00 - 12.00

Answer THREE questions

For admin. only: paper contains 4
questions

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

- 1 You have started a job at “Words ‘R’ Us” a software house that develops word processors in a variety of languages and alphabets. Your job is to answer the customer queries phone line and solve problems if they are small, or pass them on to the maintenance team if they are more substantial. After working for a month you are completely stressed out. Not only does the phone ring continuously with unhappy customers but the word processing software seems disorganised. There are many versions of the different source and object code and the only way that you can figure out what a customer is running is to try a variety of programs and see which one behaves the way the customer's product behaves. You cannot always find matching source and object code. You sometimes fix a bug in one version of the product only to get a call later on from another customer who is running a different word processor with the identical complaint. There is almost no documentation. Programmers frequently change code without notifying anyone because they don't have the time. “Words ‘R’ Us” is your future spouse's parents company so leaving the job is not an option.
 - a You suggest to your employers that unless they improve their working practices their company will not thrive. They ask you to come up with a list of of actual suggestions for improving the working practice of maintainers. Make five suggestions for improving the jobs of the maintenance programmers.
 - b It is possible to introduce side effects during maintenance. What is a maintenance side effect? Describe two coding side effects and two data side effects that you could introduce when maintaining the word processing software.
 - c Some of the word processing software is over 15 years old. What are the additional problems associated with such old code?
 - d If your employers put you in charge of the maintenance team, in addition to the suggestions made in the first part of this question list five things that you could do to improve the maintenance process?

All parts carry equal marks.

- 2 You work for the vast retail chain Sharks and Mencer. They have decided to accept both Euros and pounds at all their U.K. shops from 1 January 1999. The enlightened management have decided that instead of adapting the existing till and stock control software they will develop one from scratch using CASE tools. Many vendors of CASE tools have offered a trial copy of a software development environment (below) for a 5 week loan. It is your job to do the evaluation of the tools.
- a
- i) What is the difference between qualitative and quantitative methods? When should you choose a qualitative method and when a quantitative method?
 - ii) When would you use case studies, when formal experiments and when surveys?
- b You have decided to do a feature analysis of the tools.
- i) Choose three features that you think are important for the development of the till/stock control software.
 - ii) For your three features choose a tool (it should be a real tool) and give a feature analysis of the tool.

Both parts carry equal marks.

Turn over

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

- 3a (i) What is a software process model?
- (ii) Give two reasons why it is useful to have an explicitly defined process model.
- (iii) Why is software process improvement important? Name a model that provides a means for assessing process improvement.
- b The famous software consultancy firm Process-Automation-Is-Necessary (PAIN) has subcontracted your own consultancy company Progress-In-Levels-Limited (PILL) to advise on introducing automated process technology to the following two software development organisations:
- Organisation 1: Big Old Repetitive Environments (BORE) Ltd - which develops and customises COBOL billing systems. BORE produces many very similar information systems every year, but as a result its staff find the work tedious and tend to leave after 1-2 years of employment. This results in inefficiencies and duplicated effort when developing new systems.
- Organisation 2: EXperts Can Innovate Through Experience (EXCITE) Ltd - which develops specialised, one-off technical software systems that can take over a year to design and build. When staff leave, this has serious adverse consequences on development projects.
- For each of the above two organisations, briefly comment on the following issues:
- i) the suitability of introducing/using automated software engineering technology such as CASE tools and process-centred environments;
- ii) the kind of staff that these organisations should employ (and the kinds of training and contracts they should provide).
- c Why is UNIX not regarded as a process-centred environment? Briefly describe one class of automated software engineering tools that nevertheless make UNIX suitable for software systems development.

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

- 4a It is sometimes argued that so-called "non-functional" requirements cannot be quantified. Provide a counter-argument and illustrate it by reformulating the non-functional requirement: "the system must be easy to use" in a way that makes it "measurable".
- b Press release, 1st April 2007: "Following the software failure that left thousands of holiday makers stranded in airports around the world, holiday tour operators Staying Places have scrapped their old computer system and employed Prof. I.C. Tracer, the renowned software development consultant, to introduce a requirements engineering programme that facilitates the development of a new holiday scheduling and reservation information system".

You are Prof. I.C. Tracer.

Describe aspects of your requirements engineering programme that focus on and facilitate:

- (i) requirements elicitation and definition
 - (ii) requirements change management
- c According to Watts Humphrey, there is a Requirements Uncertainty Principle which states that: "In a new software system, the requirements will not be completely known until the users have used it". Briefly describe a general approach which may be suitable for early validation of requirements for the system described in part (b). Explain a variation of this approach that facilitates incremental development and change.

The three parts carry, respectively, 30%, 40% and 30% of the marks.

End of paper