UNIVERSITY OF LONDON
IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 2004

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 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 C222=MC222

SOFTWARE ENGINEERING - DESIGN II

Monday 10 May 2004, 14:30
Duration: 120 minutes

Answer THREE questions

Paper contains 4 questions
Calculators required

1a HTTP 1.1 introduced persistent connections. Explain what this term means and why the feature was considered desirable.

b Quite often a web browser does not interact directly with a web server, instead it communicates via a proxy.

i) Briefly describe the sequence of request/response transactions between a web browser and a server that communicate via a *proxy*. Illustrate your answer with a diagram.

ii) Briefly describe how *caching* can reduce network traffic between the proxy and the server.

c A department store has decided to launch an interactive web site, allowing customers to view merchandise, and make online purchases. Assume that there will be a set of catalogue pages for viewing merchandise, a personal information page for entering details like credit card, and a final checkout page.

i) State which HTTP request method you would choose to submit the user's personal information. Give a reason for your choice. Describe how the data is sent from the browser to the server and is passed from the server to the script.

ii) Give one example where you would choose to use client-side scripting and one example where you would choose to use server-side scripting to check the validity of the user's input.

iii) Briefly describe how state could be maintained for multiple page requests.

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

2a Briefly describe what is meant by *usability*, giving criteria by which it may be assessed.

b Norman's *User-Centered Systems Design* seeks to ensure usability by involving users in the development of a conceptual model. Briefly compare and contrast the emphasis, advantages, disadvantages, and compatibility of this design method with so-called Usability Engineering, Design Rationale, and Participatory Design methods.

c The UCSD conceptual model is sometimes expressed as a metaphor for design, well-known examples being the *office desktop*, and the *shopping cart* of internet commerce. It is evident that familiar windows-style toolkits for direct manipulation of the office desktop are not yet matched by contemporary browser software.

i) Briefly explain what is meant by *direct manipulation* as an interaction style, and how is it related to user-centred design.

ii) Using the above metaphors as examples, list three key criteria which make a metaphor a good basis for interface design, identify the problematic aspects, and illustrate how these problematic aspects can be managed.

iii) Assuming improved graphical user-interface tools for web browsing, suggest and briefly justify two ways in which better visualisation, and/or metaphor should enable more usable *navigation* of a complex web site.

Parts a, b, and c carry, respectively, 20%, 40%, and 40% of the marks.

3a State the main methods for evaluating an interactive computer system. For each of the following scenarios, briefly explain the sorts of evaluation that are possible, indicate the most practical, and the principal features of such an evaluation:

i) A large software company wants to identify problems and successes with its popular accounting package, in order to inform the design of an improved version.

ii) A designer needs an immediate assessment of a prototype new web page.

iii) A cockpit designer needs to know whether a touch screen, or a separate keypad, would be better for airline pilots when setting flight parameters.

b An electronic-commerce interface for a retail supplier offers a *customised* browsing package with a visual representation of each individual product for sale. When selecting a product for purchase, it is proposed to allow a customer *either* mouse-controlled drag-and-drop style motion of an item into a visual shopping cart, *or* mouse-controlled selection followed by a dialogue box with buttons to confirm purchase and to choose the quantity, which by default will be a single item.

i) Briefly explain those aspects of the interface for which a Keystroke Level Model is appropriate, and the distinct sequence of operations for a model with each of the two options.

ii) Provide a fair general estimate for the underlying time scale of a human reaction cycle and its main components.

iii) State and explain the pragmatic law that can be used for estimating the time required for moving a hand or mouse a given distance in order to physically select a product or to drag an item to a cart.

iv) Estimate which method of purchase is faster for a single item. You may assume that each product item has a $1cm$ visual representation, that any dialogue box appears $2cm$ from the product item and has $0.5cm$ buttons, that the cart is $8cm$ from the product, that it takes 0.1 second to depress or release a button and that the system reaction time is insignificant.

Parts a and b carry, respectively, 40%, and 60% of the marks.

4 You are asked to design an electronic form (*not necessarily an html* 'form') so that a hotel guest may make, or update, a request for wake-up call, and/or for breakfast time and content.

a Provide a simple hierarchical task diagram for the joint task of making such requests and providing confirmation, indicating basic user actions. Say how you would acquire this information.

b Assuming that this process is part of a system with electronic accounting and routing of requests, sketch the short sequence diagram of agent states and messages (or events).

c Sketch a suitable interface "form", indicating informally the type of *widgets*, manipulative actions, and their relation to the sub-goals and sub-tasks. State how you take into account any general guidelines for forms.

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