Computer Science 340

Operating Systems

FIRST TEST

1991

READ THIS FIRST !!!!!!!!!!!!!!

Answer all questions.

Make sure your name is on every piece of paper which you hand in.

Question 1 carries half as many marks as Question 2.

The number of asterisks (*) shown against each part of a question is proportional to the number of marks allocated to that part within the question.

There are TWO questions; the test lasts for 45 minutes. As I imagine you can work out for yourself, that can reasonably be interpreted as about 15 minutes for question 1 and 30 minutes for Question 2.

I expect answers in terms of the material already covered in the 340 course, augmented by such general computing knowledge as can reasonably be expected of a stage 3 Computer Science student; dissertations on topics not yet treated in the course are not required and will not receive any marks.

I try to give all the information you need to answer each question, but don't always succeed. If you consider that you have insufficient information to answer a question, don't ask a question in the test : explain your difficulty in your written answer, say what further information you would need to resolve it, and make clear any assumptions that you have made.

QUESTION 1.

One way to protect files against error is to provide facilities for keeping several recent versions ("generations") of each file. One way to protect files against accident is to use an incremental backup system. This question is about the possible combination of both of these services in the same system.

* (a) Explain clearly what the file system must do when a new version of a file is saved. How do you think file deletion should be interpreted ? Discuss possibilities.

* (b) Comment on the additional costs of the backup and retrieval operations of the combined service as compared with those of incremental backup in a conventional (unprotected) file system.

(Assume a simple restoration procedure in which the stored backup tapes are read back in order without any preliminary processing, and that the cost of an operation is measured by the amount of information (bytes) transferred between backup device and disc.)

(HINT : begin by defining clearly what the backup system is supposed to do.)

QUESTION 2.

It is proposed to construct a TUI (which stands for textual user interface - and note the local colour). The TUI displays text in windows on a screen, replacing conventional computer terminals. The TUI should handle all details of managing the screen display, but should otherwise be as simple as possible, consistent with the requirements specified.

Specification :

The TUI uses a buttonless mouse, which is used (as in the Macintosh system) to control the position of a pointer on the screen.

If the pointer lies in a window, that window is presumed to be the currently active window, and it remains the currently active window until the pointer is moved over its boundary.

Text for any window may be presented to the interface by the computer. It is always copied immediately to the appropriate window (though if the window is obscured the text may not appear immediately on the screen), and is always added at the end of the existing text in the window as with a conventional character terminal.

Text entered at the TUI's keyboard is displayed in the currently active window, if there is one, and is also sent to the computer, in some way identified with a window number.

The mouse is connected to the interface in much the same way as the keyboard (details are unimportant); there is no magical link between the mouse and the pointer on the screen.

It is only permissible to make new windows or dispose of old ones on explicit instruction from the computer.

Windows may be of any size which will fit on the screen, and may overlap. The size of a window may not be changed.

Communication between interface and computer proceeds by transmitting and receiving messages. The messages may be of any length, but must contain sufficient structure to be decipherable by their recipients.

Assume :

Interface errors need not be considered. (No errors occur within the interface; all messages arriving from the computer are correct.)

Question :

***   (a)   Design a set of messages which should be accepted or transmitted by the interface for communication with the computer during normal operation. State any additional assumptions which you make in defining the interface.

***   (b)   Are any additional facilities required if the computer is to be able to display urgent error messages on the screen ? Explain your answer.

***   (c)   What data must the TUI software maintain to manage the screen adequately ?

***   (d)   How must the TUI react to

*   (i)   a character entered at the keyboard;

*   (ii)   a movement of the mouse;

*   (iii)   a character arriving from a programme ?

_____

Alan Creak,
April 1991.