UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE AND ENGINEERING

DIVISION OF INFORMATICS

SCHOOL OF COMPUTER SCIENCE

Computer Literacy 1h

Class Examination
Sample Answers

Date: Saturday, 26 January 2002
Time: 09:30 – 11:00
Place: Adam House
Room: 1st floor

Board of Examiners

Chair: Stuart Anderson
External Examiner: ?

Instructions to Candidates

Attempt **ALL** questions in part 'A' and **ONE** question from part 'B'

Marks for questions are indicated in brackets after each question and the total for the exam is 70.

Part "A"

Answer ALL questions from this section

1. **(a)** Describe two of the differences between the GIF and JPG (JPEG) image formats. [2 marks]

    JPG is lossy and GIF isn't. GIF is restricted to 256 colours and JPG isn't. I would also part-accept a functional answer – JPG is good for real-world images and photos while GIF is better for diagrams

    (b) What is MIME-encoding used for? [2 marks]

    The transmission and encoding of binary data destined for an application, e.g. mail attachments. Anything that shows you realise that binary data doesn't travel well unaided will get you the marks

    (c) What is a path? Give an example from the World Wide Web. [2 marks]

    The 'postal address' of a file, device or other entity. I'm looking to you to supply a URL by way of example.

    (d) What are the key features of a Geographical Information System (GIS) ? [2 marks]

    A database with some concept of positional information, connectivity etc. plus layering of the information. You could mention display aspects – feature selection etc. or give a functional answer, what it is used for.

    (e) The year 1998 can be written as **7CE** in hexadecimal. What is the hexadecimal representation of the years 1999, 2000, 2001 and 2002? [2 marks]

    7D2. You need to count 4 units on the fingers and know that 'F' rolls over to '0'

2. **(a)** Two or more people communicating electronically do not behave the same way they would if speaking face to face. Why? Describe one negative result of this and how people try to avoid the problem. [5 marks]

    Lack of body language and other physical cues contributes to a psychological isolation of the participants leading to remarks being taken the wrong way and behaviour such as flaming. Being aware of the problem, being polite and cautious and lacing text with smileys and the like all help. In video conferencing situations, absence of body language and the fact that eye contact cannot be made. A lecture refers.

(b) Describe two important benefits of being able to visualise data in 3D.

[2 marks]

It allows the representation of huge amounts of data in a way that human eye and brain is good at interpreting. It allows the direct visualisation of conceptually difficult ideas difficult to represent in any other way. It allows proper representation of distance, it provides a less abstract view of the problem.

(c) Describe three functions of an operating system. [3 marks]

I'm prepared to accept a wide definition of what the operating system is here, so any of task scheduling, device management and I/O, bootstrapping, resource (e.g. virtual memory) management, the file system, maintaining configuration information, the GUI, etc. etc.

3. (a) The *Cost of Ownership* of a computer is the total cost in time and money to the owner over the computer's lifetime. What costs would this include?

[4 marks]

Buying the machine in the first place, buying software and devices, upgrading same, contract maintenance, insurance, services. Time – installing it, configuring it, preventing and sorting out problems e.g. virus infections, defragmentation. Time and money spent upgrading software and drivers with newer versions and finally selling it at a huge depreciation and buying a replacement.

(b) Briefly describe four of the stages in the historical development of current Information Technology.

[4 marks]

This could be answered from a society/use or technology point of view. Candidate points – military -> scientific -> business -> home -> pervasive use of IT. Hand-crafted machines -> huge mainframes ->mini/ microcomputers -> the PC -> converged PDA/mobiles. Paper input/output -> video -> Windows/mice/icons/menus -> voice. Standalone machines -> machines linked over WANs -> the Internet

(c) Explain what you understand by the terms *client* and *server*, giving an example.

[2 marks]

A server is a networked machine dedicated to a small number, probably a single task within a larger hierarchy of machines. It offers a service to client machines, typically on desktops. An example would be a Web server and a browser such as Netscape or IE.

4. (a) Give two practical problems that must be solved in order to establish reliable communications between computers.

[2 marks]

They have to locate each other (addressing); data has to be free of error (error detection and recovery) and delivered at a speed the recipient can accept (flow control). Any two will suffice. One could also say that they have to be connected to a network (needs modem or NIC), have appropriate software (protocol stack) etc. etc.

(b) Give examples of two physical media used for linking computers together

[2 marks]

Any two of coaxial cable, twisted-pair, phone cable, optical fibre, wireless (various forms including mobile phones), satellite.

(c) Describe the separate functions of TCP and IP in TCP/IP

[2 marks]

IP provides a best-efforts but intrinsically unreliable datagram service; TCP provides a reliable connection over IP.

(d) What is the function of a modem? [2 marks]

To allow a computer to send digital information over a noisy analogue (phone) line.

(e) Give an example of computer crime that exists because of advances in communications. [2 marks]

Paedophiles preying on children and exchanging pictures; propagation of viruses and worms; Mail forging; terrorists communicating via encrypted mail

5. (a) Explain the parts played by *algorithms*, *pseudo-code* and *program* in developing a computer-based solution to a problem. [6 marks]

The algorithm is the 'core' solution to a particular well-defined sub-problem (e.g. sorting, lookup, real-arithmetic, date arithmetic) expressed mathematically or logically. Pseudo-code is an expression of the algorithm in some regular form of natural language. The program is the detailed expression of the algorithm ready for direct translation into machine instructions. They all form part of the process of deconstructing and implementing a solution to a problem.

(b) You have a spreadsheet containing exam marks sorted by candidate name. You instruct the spreadsheet to sort the list ordered by exam mark. Assuming that a sorting algorithm that you know is being used, explain the steps involved. [4 marks]

This is an invitation to give a general account of the workings of quicksort or bubblesort as described in lectures.

Part "B"

Answer ONE question only from this section

B1. A friend is setting up a business selling florists' and craft supplies. She is aware that proper use of Information Technology (I.T.) could reduce costs and increase opportunities in her business. She asks you for advice. What would you say and do?

[20 marks]

This links to many themes through the course and in particular one lecture on problem solving and decomposition in real-life situations and use of the Web. I would expect them to consider who the person's customers are (florist and craft businesses and hobbyists), whether such people would use IT (the Web) to make purchases, the advantages (illustrated catalogues, on-line ordering etc.), disadvantages (penetration – how many florists browse the Net?), B2B versus B2C, training/mind-set issues – how able are people in the business able to take advantage of the technology themselves?. Plain old office IT also has a role to play in keeping accounts when selling lots of small items. I emphasised the need to start with a proper definition of the problem then consider what is needed to solve it, etc. etc. Those who didn't attend the problem-solving lecture will probably devote the essay to describing why the business needs a Web site and describing what it should look like, for which they will get acceptable but not full marks.

B2. There are many ways in which a computer-based project or solution can go wrong and fail to produce the benefits the designers intended. Describe some of the factors that lead to problems when people apply IT to a problem in the workplace and how these can be avoided.

[20 marks]

Again, this could start with saying that a clear statement of the problem is an essential start and that understanding the context and the nature of the people is vital. I gave a lecture on how things can go wrong though and would expect you to tell me about errors in requirements analysis, specification and/or implementation and the need for validation, verification and testing. I mentioned the use of enforced procedures and certification and feedback loops within the design and implementation process. You could talk about HCI – applications that are self-tutoring and encourage experimentation while at the same time protecting the user against destructive actions (and allowing them to undo them). You could mention validation of data on input and integrity enforcement in databases. I mentioned that problems in computer systems rarely had a single cause. You could take the question to refer to problems in machine configurations and tell me that a PC had to have a 'balanced' configuration – processor, memory and disk – in order to function as expected. All of these would be acceptable in part.

B3   Describe the principal components of a major corporate network and the functions they perform to link machines and smaller networks together reliably and securely within the corporation and to provide access to the Internet.

[20 marks]

From bottom up – nature and function of the machines themselves, interface cards, cabling, repeaters, hubs, routers, switches, firewalls. Protocols – point-to-point, addressing, packet-switching, multiplexing, routing (again), domains – intranet vs. internet. A full description of a selection of these will expand into a significant essay.

B4   As mobile phones, PDAs and laptop computers continue to converge, they can provide mobile offices to suit every budget. Outline the advances that have made this possible, some likely future developments and some of the benefits and pitfalls of the large-scale adoption of this technology in society.

[20 marks]

The machines themselves – smaller, lighter, cheaper, LCD screens, low power consumption; Availability of the mobile phone network and suitable modems; Applications and peripherals – WAP, in-car fax machines, GPS-based information services. Still to come – G3 and adequate speed; wearables, Bluetooth (again), voice input and output (no keyboards). Benefits are constant availability of information irrespective of location and permanent accessibility of the person. Drawbacks include exactly the same things! and also information overload, cyber-stalking, security breaches. Benefits are increased business effectiveness.