

UNIVERSITY OF EDINBURGH
FACULTY OF SCIENCE AND ENGINEERING
DIVISION OF INFORMATICS

Computer Literacy 1h

Degree Examination
Sample answers

Date: Friday, 31 May 2002

Time: 14:00 – 15:30

Board of Examiners

Chair: D.K. Arvind

External Examiner: R. Dyckhoff

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.

Candidates in the third or later year of study for the degrees of MA(General), BA(Relig Stud), BD, BCom, BSc(Social Science), BSc(Science) and BEng should put a tick () in the box on the front cover of the script book.

Part "A"

Answer ALL questions from this section

1. (a) For most purposes the prefix "K" (Kilo-) means 1,000. When used in I.T. it means 1,024. Why? [2 marks]
Because real-world arithmetic is base 10 and powers of 10 are 'round' numbers and convenient multipliers. Computers use base 2 so powers of 2 are 'round' numbers. $2^{10} = 1024$ and is close enough to 1000 to be a convenient multiplier. Half marks for realising that powers of 2 feature here.
- (b) I bought a 2 GHz processor this year. Assuming processor speeds obey Moore's law, show approximately what speed of machine I am likely to replace it with in 2005/6. [2 marks]
Processor speeds double every 18 months or so. 3 yrs = 2 lots of 18 months i.e. a factor of 4 so 8GHz. Half marks for not explaining, or having the right idea but figures rather off.
- (c) My machine contains a 60 Gb, 7200 rpm 3.5" IDE hard disk. Explain the significance of the terms in this description. [2 marks]
60 Gb (Gigabytes) is the capacity; 7200 rpm is the rotational speed and thus an indication of performance. 3.5" is the platter diameter so describes the physical size of the disk drive. IDE is the type of interface. Half a mark per item.
- (d) When would you use a Revision Control System and what kind of problem would it prevent? [2 marks]
Programmers would use one when writing a complex program or suite of programs to manage the process of recording changes. It allows backtracking and prevents a situation where changes are applied to the wrong version.
- (e) Describe what you understand by the term 'layered' when applied to software. [2 marks]
A form of organisation where 'higher level' software uses lower level software to perform subsidiary tasks and so on down to the hardware. It represents a breakdown of a problem into simpler and simpler units.

2. (a) Describe some of the functions and capabilities of a Database Management System (DBMS). [4 marks]

The question requires an indication you have some clue what goes on in a database. It can be answered top-down or bottom-up. The lectures touched on the applications of databases then basic principles. The idea of a schema being distinct from the data was mentioned and the basic database operations – joins, intersections, unions and so on covered with suitable examples. Database relations and integrity were mentioned. GIS were covered in the same lecture so will probably be used as examples. A mark for each valid point mentioned.

- (b) Describe three things that have to be simulated to produce a realistic computer graphic representation of a real-world scene. [3 marks]

Pick any three of: Geometry/shape of the object, absence of hidden lines, perspective, colour, curved surfaces, shading, illumination, surface texture, reflections and shadows.

- (c) Describe three features you would expect of a well-constructed software application. [3 marks]

Pick three from: appropriate to purpose, intuitive for the novice, supportive of the advanced user, unobtrusive, tolerant of experimentation, fail-safe, self-tutoring, consistent, reliable, versatile ...

3. (a) Describe some of the physical problems people can experience when using computers for long periods and how these may be alleviated. [4 marks]

An invitation to talk about RSI, backache/stiffness, headaches etc. Wrist rests, care over posture and lighting, taking breaks, being aware of the condition of monitors and so on all ease the problem.

- (b) Describe some of the ways in which the services offered by an Internet Service Provider can be abused. Choose one and describe how the problem can be made less severe. [4 marks]

Many possible answers. E-mail flaming, spam, propagation of viruses, hacking, paedophiles preying on children, denial-of-service attacks. Solutions include respectively netiquette, (none yet), antivirus software, diligence and awareness, education, firewalls.

- (c) Why do you defragment a disk? [2 marks]

To improve performance. A disk becomes fragmented when the process of writing files to it over time breaks up the space so that files are located in extents all over the disk surface. The result is excessive disk head movement – defragmenting reverses the process.

4. (a) Outline in pseudocode the steps in an algorithm describing making a telephone call where the receiver has an answering machine. [3 marks]
Some variant on:

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Take receiver "off hook";
if no dialtone
    replace receiver;
    find fault;
else {
    dial number;
    wait until response or [time];
    if not answered after [time]
        replace receiver;
    else if busy or unobtainable
        replace receiver;
    else if person answers {
        conduct conversation;
        replace receiver;
    } else if machine answers {
        listen to message until beep;
        leave message;
        replace receiver;
    }
}

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(as per lecture notes though answering machine is a variant). The requirement is for you to demonstrate you understand the process of taking a problem and decomposing it and presenting it in a logical manner.

- (b) List one characteristic for each of the so-called 1st, 2nd, 3rd and 4th generations of programming languages. [4 marks]

1stG: highly machine-specific, hand-coded instruction by instruction, no translation required; 2ndG still somewhat machine-specific, symbolic representation easier to deal with, translation via assembler; 3rdG: machine-independent, closer to natural language, complex code possible (loops, parameters, procedure calls, data structures, recursion; 4thG: Closer to natural language, less knowledge of machine required, more emphasis on programmer productivity, matched to application

- (c) Illustrate Selection Sort on the following set of numbers. Show the set after each change with the final sorted set having the smallest value on the left and the largest on the right.

17 20 11 31 9 19. [3 marks]

17 20 11 31 9 19 (start)
9 17 20 11 31 19
9 11 17 20 31 19
9 11 17 19 20 31 (finish)

5. (a) Explain why it is necessary to control the rate of flow of information between two computers. [2 marks]
Failure to do so will result in the receiving machine being over-run and data being lost
- (b) Explain unicast, broadcast and multicast. [2 marks]
unicast: one-to-one message; broadcast: one-to-everyone message; multicast: message to selected recipients
- (c) Why is packet-switching important? [2 marks]
Impossible to manage network resources properly unless all users are granted a time-limited share of communications pathways; response can be made to correlate with demand.
- (d) What is Gigabit Ethernet? [2 marks]
Networking based on conventional 10 Mbits/sec CSMA/CD Ethernet but which is driven at 100 times faster, is switched and runs full-duplex. (from lecture notes)
- (e) Explain why carelessness can be extremely costly in the age of web-based publishing in ways never experienced when publishing conventionally [2 marks]
Ease of publication (to a potentially huge audience) can bring litigation; Publication is international (what is legal in one country may not be in another); indexing services can give published material prominence never intended. Examples would also be accepted.

Part "B"

Answer ONE question only from this section

- B1.** The managing director of a small company making self-assembly furniture believes that changes in all areas are necessary to keep the product competitive. He needs to work out and write proposals then present them to the company Board to convince them to authorise the necessary action. Consider how such an idea might progress from initial idea to finished presentation and describe **all** the areas you can think of in which IT is used to develop the proposal. The company buys materials from several suppliers and all areas of the company will be affected – design, supply, manufacturing, distribution, finance, advertising, people and organisation. Opinions will need to be sought from key people. Money will have to be spent on equipment and possibly a loan arranged with the bank (and paid off over an agreed period). [20 marks]

This is an invitation to demonstrate awareness of the pervasive nature of IT in a modern business. The proposer needs to research his proposal, checking the design of the product [CAD package], prices [Web, database], costs of manufacture [spreadsheet] and market conditions [stats package]. He needs to discuss it with others [email], make presentations to interested parties [presentation graphics package]. He may need to ask "what if?" questions [spreadsheet] and optimise the new production process [LP package]. The new product will need to be advertised via fliers [DTP package] and the Web site [Web design]. All along the way, reports will need to be written and circulated [word processing software]. There are probably other more specialised packages to do with designing the production process.

- B2.** A friend runs a small publishing/artwork business (pamphlets and so on) with four or five Windows 98 systems and associated printers etc. on an office LAN, connecting to the outside world via ISDN into one machine. The machines were bought in 1999 and have been fine for the purpose so far (a little slow maybe) and are used heavily but no-one has touched the systems since they were installed by the supplier. She asks you if you could do a 'health check' on the systems, fix, advise and update them as necessary then come in monthly to perform system maintenance. What would you look for (and if necessary, repair) in your 'health check' and what would you do on a monthly basis once you were happy with the state of the systems? Money can be found if it is necessary to buy anything. [20 marks]

After three years, software such as Internet Explorer, Acrobat etc. will be out of date and is probably worth updating. Anti-virus software should be checked to see if it is on an update subscription and if not, new software installed and the system checked for viruses. The hard disks should be checked to see how files are organised and questions asked about backup. Once backed up the disks will probably need defragmentation. If disks are filling up then it may be sensible to buy a CD-writer to archive material and/or add additional hard disk space.

Service packs and upgrades will be available for most other software (Office, Windows itself, any DTP software they have) and it would be worth seeing if it is worth buying upgrades. It is quite likely that expectations have increased and it is time to plan an upgrade path for the machines – possibly more memory now and a programme of replacement over the next years. ISDN is old technology and a check made to see if there are better options such as cable. Monthly you would check that anti-virus software is being updated, backups are being done, disks are not filling or becoming fragmented, ask about problems, apply any relevant software updates.

- B3.** As a home computer user you may be faced with choosing between a variety of network service options. Explain what this means and discuss the issues and considerations that may play a part in your choice. [20 marks]

ADSL and cable Internet are both examples of 'broadband' services, normally described as always-on network services running at 256Kbit/second or more. Is either service available? I.e. do we have a choice at all? (cable unlikely to be found outside major towns and cities, ADSL is unavailable more than about 2Km from exchanges). Cost is a consideration – ADSL more expensive than cable till very recently (now coming in to line) also packages may affect this either through rental (e.g. cable internet + TV bundle) or reduced installation cost deals. Service provider may offer additional services such as mail, web-hosting, search engine/portal and content. Contention ratios figure (mentioned in lectures). Dial-in is always a possibility; some form of tariff package will be needed that keeps costs of long calls within reason but this has the disadvantage of competing with the voice phone line unless a second line is rented. ISDN is also available but is slower than broadband and more expensive than dial-in. [etc. etc.] Material from newspapers and personal experience possible here.

- B4.** “Wireless networking links the fridge, the foyer (hotel) and the forest.” Explain what this means in terms of the social and technological possibilities of wireless networking. [20 marks]

This question is about the freedom from physical location offered by wireless interconnection. Technologies are: Bluetooth (very short distances, e.g. from the fridge to the house controller), 802.11 (Ethernet services becoming standard offering in hotels, airports and Internet cafes), and cellular services, especially WAP and G2.5/G3, capable of offering full connection from the car or the forest. The question is an invitation to compare and contrast the various types of wireless technology and the possibilities they offer; “Linking” is a clue to consider how the three styles of networking can be used in conjunction with each other.