GENERAL COMMENTS

Teachers should note that the comments made in this report are based on the *Information Technology Study Design* 2000–2002. A reaccredited study design has been implemented in 2003.

Almost all 2986 students completed the paper. The structure of the examination paper was similar to the previous year. The examination booklet comprised nine questions. The marks allocated to a question are a useful guide as to how much detail is required in a response.

The maximum possible score was 94. The case study and resource material relating to the case study were printed on a detachable insert placed in the centrefold of the examination booklet. Students were expected to detach the insert so they would have the case study in front of them to refer to as they were responding to the questions. However, the case study insert remained intact in a significant number of examination booklets. Teachers should explain to students the purpose of the case study being detachable and demonstrate how to best use it.

For many questions, students could only obtain full marks where their responses specifically related to the case study. In order to demonstrate their understanding of a given concept, students needed to apply their knowledge to a specific situation – in this case EASI. Teachers are advised to prepare students by insisting that responses to practice questions include specific reference to the case study upon which each question is based.

It was pleasing to note that Question 2, the data flow diagram and Question 6, the algorithm test data, were better answered this year. Question 5 relating to variable identification and algorithm error checking was poorly answered and Question 9 relating to data acquisition for system evaluation proved difficult for students.

Teachers are urged to impress on their students the importance of reading each question carefully and reading the question again after completing their response to ensure it has addressed the question. A number of students who wrote strong responses underlined the key words in the questions. Teachers should provide students with practice at identifying and underlining, or highlighting, the key words in questions so that they learn to identify the focus of the question. Teachers should strongly discourage students from using pencil when writing their responses.

SPECIFIC INFORMATION

Question 1

This question required students to demonstrate their understanding of the role of information systems in organisations. Information technology is concerned with the role of information systems in assisting organisations to achieve their goals and students must learn how an information system fits into an organisation. An organisation has goals to achieve; it sets measurable objectives that can be used to evaluate achievement of its goals. Those organisation goals and objectives determine the information system goals, which are achieved by setting and reaching measurable system objectives. System objectives usually set targets regarding the quality of the content and format of output and/or the speed at which output is generated. An example from the examination case study:

Organisation goal	Take a leading role in delivery of tests for assessment of industry certificate qualifications.
Measurable organisation objectives	Assess 25% of all students seeking qualifications
Information system goal	Provide online assessment.
Measurable system objectives	Display student success state immediately after examination completed.
	Securely store examination and student data.
Organisation goal	Reduce the cost of providing high quality learning materials.
Measurable organisation objectives	Cost of learning materials to be less than $x per student.
Information system goal	Learning materials to be in electronic form.
Measurable system objectives	Deliver course materials via the Internet.

<table>
<tr><td></td><td>a
0/4 10
1/4 16
2/4 27
3/4 30
4/4 17
(Average mark 2.26)</td><td>Most students managed to identify two system goals and explain how they would contribute to the organisation's goals (aims) but many responses indicated students had misread the question or did not relate specifically to the case study. A number of students were unable to draw the distinction and wrote responses focusing on how the organisation (rather than the system) could achieve its aims.
Expected answers included.
<table><tr><th>Aim of organisation</th><th>How system could assist achieve the organisation aim</th></tr><tr><td>… take a leading role in delivery of tests</td><td>online testing that provides immediate feedback to student</td></tr><tr><td>… ensure company's activities meet the needs of the students</td><td>online training materials allow students to study in their own time at their own pace</td></tr><tr><td>… develop the client base for the company at a national level</td><td>by locating assessment centres across Australia students can sit examinations at the assessment centre nearest to their homes</td></tr><tr><td>… reduce the cost of providing high quality learning materials</td><td>once the online learning materials have been developed delivery costs to students is minimal compared with print materials which include costs of printing, photocopying and postage</td></tr></table></td></tr>
<tr><td></td><td>b
0/2 47
1/2 36
2/2 17
(Average mark 0.7)</td><td>Poorly answered, this question required students to demonstrate their understanding of the distinction between organisational goals and information system objectives. Students were expected to write an objective that could be measured and many found this task difficult. Acceptable responses included:
provide secure storage of examinations and student data
accurately and reliably measure student achievement
provide an online method of assessment
allow access to course material from all areas of Australia.</td></tr>
<tr><td>Question 2</td><td>0/10 14
1/10 5
2/10 5
3/10 5
4/10 6
5/10 9
6/10 10
7/10 13
8/10 12
9/10 12
10/10 9
(Average mark 5.47)</td><td>Most students identified some of the processes and most of the files represented in the data flow diagram (DFD). Some students confused processes with stores (files).
Those who labelled the processes by beginning the process label with a verb tended to score better, for example: Book examination, Upload bookings, Sit examination, Compare student responses with solutions, Send results.
Most students recognised that each data store held different data and labelled the stores with different file names. Less successful students, however, did not recognise the difference between the Examination bookings file and the Examinations file. Students must learn that DFDs are an important tool in systems analysis and they should be able to correctly identify all elements of a DFD (including data sources, destinations, processes, data stores and data flows) and attach the appropriate symbols to them.</td></tr>
<tr><td>Question 3</td><td colspan="2">Students were required to demonstrate knowledge of two of the three network topologies (bus, star, token ring). Students should have demonstrated understanding of the basic structure (e.g. briefly, a star network has a central computer with each terminal attached directly to it; in a bus network each device is attached to a central backbone and can communicate with any other device attached; and in a token ring each device is attached to the next device with no central computer).
Students should also have demonstrated a basic understanding of how data is transmitted over the network (e.g. in a star network data is transmitted from each node directly to the central computer; in a bus network all nodes share the central backbone for transmitting data and in a token ring the data travels in one direction from one node to the next until it reaches the destination node).</td></tr>
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<table>
<tr><td></td><td>a
0/4 18
1/4 12
2/4 20
3/4 24
4/4 26
(Average mark 2.29)</td><td>Most students identified an advantage and disadvantage of two network topologies. Less successful students confused bus networks with star networks. A number of students wrote one word responses such as ‘cheaper’, ‘quicker’. Such responses were unacceptable as the question required students to describe one advantage and one disadvantage.
Acceptable responses included:
<table><tr><th></th><th>Advantage</th><th>Disadvantage</th></tr><tr><td>Star</td><td>• a break in the cable between a computer terminal and the central computer affects only that one computer
• faster transmission of data</td><td>• more expensive because it uses more cable</td></tr><tr><td>Bus</td><td>• a problem with one computer will not affect others
• is relatively inexpensive because it uses less cable than the Star</td><td>• if the backbone breaks then data transmission to all stations beyond the break is disrupted
• network traffic along the one cable means more chance of data collisions</td></tr><tr><td>Token Ring</td><td>• less degradation of performance as traffic increases
• less cabling so cheaper to install</td><td>• a break in the cable affects all terminals
• terminals are more difficult to connect and disconnect</td></tr></table>A few students offered responses describing the advantages of particular network protocols. This is not the place for a full discussion about networks. However, students would find useful information at an appropriate level of sophistication and complexity at www.howstuffworks.com and by reading about the OSI model which distinguishes the data communications functions of networks.</td></tr>
<tr><td></td><td>b
0/3 10
1/3 36
2/3 31
3/3 23
(Average mark 1.66)</td><td>This question was poorly answered. Many students were unable to make a recommendation specific to the assessment centres. More successful students identified that the star network:
• ensures that if one computer breaks down all other students sitting the examination could continue working on their terminals
• gives faster data transfer speed which could be an issue for examinations using graphics data.
Marks were awarded for recommending the bus network where the reasons given were logically acceptable for the assessment centres.</td></tr>
<tr><td>Question 4</td><td colspan="2">This question was similar to Question 1 on last year’s examination. However, it was poorly answered mainly because students did not read the question parts correctly.</td></tr>
<tr><td></td><td>a
0/3 41
1/3 2
2/3 6
3/3 51
(Average mark 1.67)</td><td>The question asked students to identify how the hardware specification could be changed. Many students just identified a hardware item. Most students were able to explain why the change was important for examination security. An appropriate change to the hardware specification was to remove the floppy disk drive/CD-RWdrive/printer (only one of these was expected but many identified more than one). This change was important for examination security to prevent students copying their test and distributing it to others.
A few students suggested removing the sound card and speakers but these would not affect system security. Some students suggested removing the hard disk drive but this is needed to store the system programs.</td></tr>
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<table>
<tr><td></td><td>b
0/6 19
1/6 5
2/6 13
3/6 13
4/6 17
5/6 12
6/6 21
(Average mark 3.25)</td><td>Most students identified appropriate hardware specifications (capacity and capability) and were able to provide a reason for the selection. Successful answers identified the speed of the network card as important for ensuring fast transfer of student response data and identified the capacity of the hard disk drive because it must store all the examinations and student data.</td></tr>
<tr><td></td><td>c
0/6 17
1/6 3
2/6 10
3/6 15
4/6 16
5/6 11
6/6 28
(Average mark 3.55)</td><td>Most students do not understand the functions of a computer operating system. Operating systems are continually developing and newer operating systems include features once regarded as extras. However, the basic concept is that an operating system controls the operations of a computer; hence its functions include: controlling the hardware and peripherals, providing a user interface, managing processing tasks, managing files and controlling access.
The question specifically required students to identify software functions related to security of examination data and student results. Students could only be awarded full marks if their answers addressed security issues that relate to controlling access. Acceptable answers discussed logon IDs and passwords for students to ensure only authorised users could access the system, firewalls to prevent hackers and other companies stealing the examinations and/or student results, levels of access to stored files to ensure users had access only to those programs and files needed (for example, students should have access only to the examination they were sitting).</td></tr>
<tr><td>Question 5</td><td colspan="2">Few students answered this question correctly. Many students were unable to differentiate variable types and a considerable number were unable to comprehend the algorithm. The study design emphasises the importance of design in methodical problem solving. Teachers should ensure that students are taught how to use problem-solving tools such as flow charts and structure charts and particularly pseudo code for representing solutions to programming problems.</td></tr>
<tr><td></td><td>a
0/4 41
1/4 18
2/4 18
3/4 15
4/4 8
(Average mark 1.31)</td><td>Expected responses to this question included:
<table><tr><th>Variable types</th><th>Variable names</th></tr><tr><td>Alphanumeric</td><td>choice, student_ID, Unit_No</td></tr><tr><td>Array</td><td>correct_response</td></tr><tr><td>Boolean</td><td>success</td></tr><tr><td>Integer</td><td>pass_mark, examination_score, counter</td></tr></table>Most responses indicated students had no idea what a Boolean, Integer, or Array variable type was. This could be explained by a number of issues:
insufficient emphasis on programming in coursework
student attempting only simple programming activities with one variable type (alphanumeric)
copying program statements from a source rather than creating their own</td></tr>
<tr><td></td><td>b
0/2 53
1/2 10
2/2 37
(Average mark 0.84)</td><td>This question, and 5c, tested students' ability to read and understand an algorithm. Many students either did not respond or gained no marks for their response as they failed to recognise that the missing line calculated the examination score. The expected response therefore was examination_score ← examination_score + 1</td></tr>
<tr><td></td><td>c
0/3 63
1/3 2
2/3 4
3/3 31
(Average mark 1.02)</td><td>Students were expected to correctly identify the error as being that the examination score had to equal the pass mark for a student to pass. These students generally were able to correct the error with this statement: if examination_score >= pass_mark then.</td></tr>
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<tr><td>Question 6</td><td>0/8 11
1/8 4
2/8 7
3/8 13
4/8 13
5/8 9
6/8 18
7/8 6
8/8 19
(Average mark 4.49)</td><td>This question assessed students' knowledge of testing of algorithm rules and processes, i.e. an algorithm should test valid and expected input, valid and unexpected input, input data outside the expected range, the boundaries etc. The algorithm presented these rules:
if student in file continue
if success (is true) then if examination score >= 95 print a high distinction certificate
if success (is true) then (if examination score >=95) print a pass certificate
if success (is false) then (examination score <80) print a letter.
The data sets presented by students should have addressed testing of the above rules.
To gain full marks a student needed to supply for example:
invalid student ID, valid unit_no, valid examination score, success = Y to test that student existed in file
valid student ID, valid unit_no, examination score = 97, success = Y to test that a high distinction certificate is printed
valid student ID, valid unit_no, examination score = 95, success = Y to test the boundary of high distinction certificate
valid student ID, valid unit_no, examination score = 86, success = Y to test that a pass certificate is printed
valid student ID, valid unit_no, examination score = 75, success = N to test that a letter is printed.
A common error was to give as the reason for a test a statement like 'to test whether the student gets a high distinction' or 'to test if program recognises student passed'. The algorithm in fact, printed a document after evaluating the variable so only those students who stated that a document was printed and identified the type of document could gain full marks.</td></tr>
<tr><td>Question 7</td><td colspan="2">This question focused on network issues and students' responses were variable. Whilst most students demonstrated some understanding of security issues in networks many had difficulty distinguishing between using the Internet to connect to a remote computer and using a direct line.</td></tr>
<tr><td></td><td>a
0/4 4
1/4 6
2/4 16
3/4 21
4/4 53
(Average mark 3.12)</td><td>This question was well answered with most students able to describe an advantage of direct line such as how it could be quicker, more secure, more reliable and a disadvantage such as the installation expense and limited use because it provided access to only one computer. Many described an advantage of Internet connection as the fact that it is relatively cheap, and can be used for other purposes such as accessing the EASI website. Others described a disadvantage of Internet connection as being the lack of security and the problem of reliability of access given demand on ISP resources.</td></tr>
<tr><td></td><td>b
0/4 11
1/4 9
2/4 37
3/4 12
4/4 31
(Average mark 2.43)</td><td>Students who gained full marks related the question directly to the case study by identifying the need for security of student response data during transfer to head office and reliable access to the remote computer. Many recommended the direct line because it is likely to be more secure and more reliable with less likelihood of data interference. Others gained full marks for recommending an Internet connection because the firm already had this and it could be used for other purposes as well as transferring student data to and from EASI head office. These students also recommended measures for ensuring data security by for example, the use of encryption software and firewalls to protect the data.</td></tr>
<tr><td></td><td>c
0/4 6
1/4 6
2/4 35
3/4 17
4/4 36
(Average mark 2.71)</td><td>This question was quite well answered. Most students selected the use of a logon ID with password as an appropriate procedure. Suggestions for the second procedure included:
student give two forms of ID (one including a photo) to a supervisor when presenting for the examination
student provide ID which the examination centre supervisor matched against a database held on computer
student provide ID through a biometric scanner such as handprints, retina scans.
The question required students to describe a procedure not a tool. To gain full marks students had to state how the tool would be used. Students who, for example,</td></tr>
</table>

		wrote 'student gives two forms of ID' did not meet the requirements of the question. To gain full marks the student should have added '… to the examination supervisor to check against EASI records'.
	d 0/6 7 1/6 2 2/6 15 3/6 16 4/6 30 5/6 16 6/6 14 (Average mark 3.65)	This question was quite well answered; not only those students who related the explanation to the case study could get full marks. A good answer was supplied by a student who suggested an appropriate method of protection would be 'encryption which would scramble the results in an email so that only those with the correct key (tutor and head office) will be able to read the text'. This answer described a method of protection and explained how that method was relevant to EASI. Other acceptable answers included: • the tutor could install a privacy product such as PKI or PGP so that only the tutor (who had the appropriate key) could open the email • the results could be sent as an email attachment which was encrypted with the tutor as the only person with the key who could read the attachment • the results could be sent as an email attachment which was protected with a password within. The tutor as the only person with the password who could open the attachment.
	e 0/4 29 1/4 9 2/4 28 3/4 12 4/4 22 (Average mark 1.89)	Less successful students were either unable to distinguish physical security measures from electronic security measures or they identified only a security tool and did not provide a **description** of the security measure. Answers that supplied only the words 'use locks' or 'security cameras' were insufficient. More successful answers stated something like 'locks on the assessment centre doors and windows would deter potential break-ins by rival companies or 'security cameras could identify intruders'.
Question 8	0/9 6 1/9 3 2/9 8 3/9 14 4/9 13 5/9 13 6/9 21 7/9 7 8/9 5 9/9 10 (Average mark 4.79)	This question was not well answered. Most students identified tasks that had to be done to 'operate and maintain the system'. Few students, however, could supply correct titles for people performing the tasks and many students confused the roles. Students were expected to list selections from these types of people: • information system manager • network administrator • database manager • network technician • system trainer (train assessment centre supervisors, tutors and students in use of the system) • web manager/officer • programmer (update examinations programs, provide code for website). Some suggested a systems analyst would be needed but this person is not involved in maintaining or operating a system. Similarly, an accountant and Managing Director might be needed by the organisation but these people are not involved in maintaining or operating the information system.
Question 9	0/8 11 1/8 6 2/8 13 3/8 16 4/8 21 5/8 15 6/8 11 7/8 4 8/8 3 (Average mark 3.55)	As with Question 9 last year, this question was poorly answered. Although many students were able to identify a data collection technique, few students were able to describe a method of evaluation. Many students identified a data collection technique but did not write how it might be used. For example, running costs may be evaluated by comparing monthly expense reports to discover the trend. Responses that merely stated 'monthly expense reports' were inadequate. User friendliness of the interface could be evaluated by surveying the students and analysing the responses. Reliability of data transfer could be evaluated by keeping a record of all instances of data corruption and comparing this against a preset standard. The disaster recovery plan could be evaluated by crashing the system, documenting the recovery time and comparing this against the standard.