



2004 INFORMATION TECHNOLOGY STUDIES

ATTACH SACE REGISTRATION NUMBER LABEL
TO THIS BOX

QUESTION
BOOKLET

1

13 pages, 9 questions

Part A: Short-answer Questions

Wednesday 10 November: 9 a.m.

Time: 3 hours

Examination material: Question Booklet 1 (13 pages)
Question Booklet 2 (17 pages)
one SACE registration number label

Approved dictionaries and calculators may be used.

Instructions to Candidates

1. You will have 10 minutes to read the paper. You must not write in your question booklets or use a calculator during this reading time but you may make notes on the scribbling paper provided.
2. This paper consists of two parts, each printed in a separate booklet:

Part A: Short-answer Questions (Questions 1 to 9)

Answer ALL questions in Part A. Write your answers in the spaces provided in Question Booklet 1. You may write on page 13 if you need more space.

Part B: Extended-response Questions (Questions 10 to 16)

Answer ALL questions in Section 1 of Part B. Write your answers in the spaces provided in Question Booklet 2.

Answer only ONE question from Section 2 of Part B, which consists of three structured-response questions. Write your answer on pages 14, 15, and 16 of Question Booklet 2.

You may write on page 17 of Question Booklet 2 if you need more space.

3. The allocation of marks and suggested allotment of time are:

Part A	56 marks	60 minutes (approximately)
Part B		
Section 1	71 marks	85 minutes (approximately)
Section 2	30 marks	35 minutes (approximately)
Total	157 marks	180 minutes

4. Attach your SACE registration number label to the box at the top of this page. Copy the information from your SACE registration number label into the box on the front cover of Question Booklet 2.
5. At the end of the examination, place Question Booklet 2 inside the back cover of Question Booklet 1.

**STUDENT'S DECLARATION ON THE USE OF
CALCULATORS**

By signing the examination attendance roll I declare that:

- my calculators have been cleared of all memory;
- no external storage media are in use on these calculators.

I understand that if I do not comply with the above conditions for the use of calculators I will be in breach of the rules and liable to a penalty of receiving zero marks for the examination.

Answer ALL questions in this question booklet for Part A in the spaces provided after each question. You should spend approximately 60 minutes on this part. The allocation of marks is shown in brackets at the end of each part of each question.

1. From the following list, select the most appropriate terms to complete the statements given below.

- | | |
|-------------------|----------------|
| A Client-server | G Key |
| B Compression | H Machine code |
| C Constraint | I ASCII code |
| D Encryption | J Protocol |
| E Firewall | K Pseudocode |
| F Global variable | L Validation |

Each statement has one missing term, which is indicated by three dots.

Write the letter for each term chosen in the space provided at the end of each statement under the heading 'Term'.

There are more terms than statements. Each term can be used only once.

<i>Statement</i>	<i>Term</i>
(a) The first generation of programming languages is referred to as . . .	_____
(b) A . . . is a factor that affects the achievement of an objective.	_____
(c) To protect an organisation from an external hacker, every packet of data sent between its intranet and the Internet passes through a . . .	_____
(d) The process of converting a message into meaningless text is called . . .	_____
(e) A . . . is a set of rules that enables the exchange of data between computers.	_____
(f) A memory location that is accessible to a whole program is called a . . .	_____

TOTAL: 6 marks

2. Computer systems store programs and data in ROM as well as in RAM.

(a) Explain why a computer system needs both types of memory.

ROM: _____

RAM: _____

_____ (2 marks)

(b) Various processes occur when a computer system boots up.

Describe these processes in the order in which they occur. Some terms that you may wish to use in your answer include: BIOS, CMOS, operating system, POST, RAM, ROM.

_____ (4 marks)

(c) A computer has been booted up and a word processor has been used to open a document.

In the box below, list the probable contents of this computer's RAM.

(2 marks)

TOTAL: 8 marks

3. A hospital uses a client–server network to perform a variety of tasks such as storing patients’ personal details and billing patients. It employs a systems analyst, a system administrator, and several programmers and technicians to run its information system.

(a) Outline the role of *each* of the following employees.

(i) Programmer.

(ii) Systems analyst.

(iii) Technician.

(3 marks)

(b) For *each* of the problems described below, identify (from the following list) the employee who is responsible for *correcting* the problem:

- Programmer
- Systems analyst
- Technician.

Give a reason for your answer.

(i) A patient’s account contains the correct treatment costs, but has an incorrect total.

Employee: _____

Reason: _____

(ii) A computer in one of the hospital wards no longer has access to the network.

Employee: _____

Reason: _____

(2 marks)

TOTAL: 5 marks

4. A characteristic of machine code is that it can be executed by the CPU.

(a) State *another* characteristic of machine code.

(1 mark)

(b) Describe the process used by a compiler to create machine code from source code that was written in a high-level programming language.

(2 marks)

(c) Outline *one* advantage of using a compiler, rather than an interpreter.

(1 mark)

(d) Outline *one* implication of the copyright law for a:

(i) programmer.

(ii) software user.

(2 marks)

TOTAL: 6 marks

5. Con, who lives in Adelaide (Australia), sends an email to Lili, who lives in Kuala Lumpur (Malaysia). Both Con and Lili use a modem to connect their computers to their Internet service providers, who supply them with their own email account.

(a) Explain why Con's and Lili's computers need to use a modem.

_____ (1 mark)

(b) (i) Identify *two* communications media that could be used to transmit Con's email.

Media 1: _____ Media 2: _____

(ii) Outline the method by which *each* of these communications media transmits Con's email.

Method (Media 1): _____

Method (Media 2): _____ (2 marks)

(c) Lili's computer does not instantly receive Con's email.

(i) Suggest where the email waits until Lili collects it. Give a reason for your answer.

_____ (1 mark)

(ii) Identify the steps that Lili must follow to receive Con's email.

_____ (1 mark)

(d) Lili receives an email that contains only text with no attachments. She is concerned that the email could contain a virus. Is this a possibility? Explain your answer.

_____ (2 marks)

TOTAL: 7 marks

6. Thea loses the assignment task sheet given to her by a teacher. The teacher tells Thea that the assignment task sheet is stored on the school's intranet.

(a) Explain the term 'intranet'.

(1 mark)

(b) Each computer connected to the school's network has its own IP address.
Explain the term 'IP address'.

(1 mark)

(c) Describe how the school's network operating system can be used to protect the file containing the assignment task sheet from being modified by a student.

(1 mark)

(d) Outline *one* advantage for Thea of having the assignment task sheet stored on the school's intranet.

(1 mark)

(e) Outline *one further* advantage for Thea if the school's intranet is connected to the Internet.

(1 mark)

TOTAL: 5 marks

7. A hotel company provides an information system for its customers to use to book rooms in any hotel that belongs to the company. The information system is accessed by using a touch screen located in the foyer of each of the company's hotels.

(a) Explain *two* benefits of using relational database software for this information system.

Benefit 1: _____

Benefit 2: _____

_____ (2 marks)

(b) State the aim of this information system.

_____ (1 mark)

(c) State *one* possible objective of this information system.

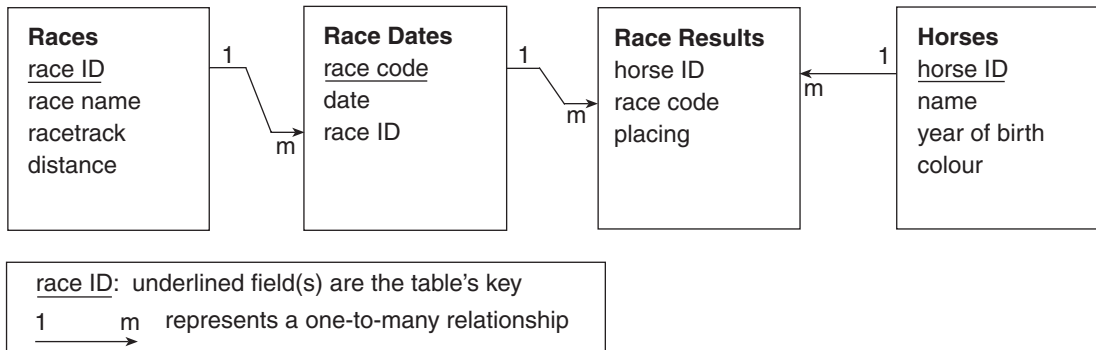
_____ (1 mark)

(d) Describe *one* constraint that would impact upon the data stored in this information system.

_____ (1 mark)

TOTAL: 5 marks

8. A horse trainer uses a database to store the race results of his horses over a number of years, during which time the prize money for a race can change. A table relationship diagram of the database is shown below.



- (a) The database must store the following data.

<i>race name</i>	<i>racetrack</i>	<i>distance (metres)</i>	<i>date</i>
Graalman Derby	Oakfield Park	1200	5.7.2003
Deakin Handicap	Santa Maria	1600	20.9.2003
Summer Handicap	Oakfield Park	1600	31.12.2003
Graalman Derby	Oakfield Park	1200	3.7.2004

Explain why the database needs the **Race Dates** table.

_____ (1 mark)

- (b) Explain why the **Race Results** table is needed by the database.

_____ (1 mark)

- (c) The database must store these two facts:

- A horse is ridden by a jockey during a race.
- Each race has its own allocated prize money.

- (i) Add the fields 'jockey' and 'prize money' to the database.

- (ii) Explain your reason for placing *each* of these fields in the relevant table.

jockey: _____

prize money: _____

(2 marks)

- (d) Identify the most appropriate data type and field size from the following list for *each* field in the table below. Complete the table.

<i>Data Type</i>	<i>Field Size</i>
Boolean	1 bit
Byte	1 byte
Text	1 byte per character
Integer	2 bytes
Long integer	4 bytes
Date/time	8 bytes
Currency	8 bytes

<i>Field Name</i>	<i>Data Type</i>	<i>Field Size (bytes)</i>
race name		
placing		
prize money		

(2 marks)

- (e) State the impact on the database if the following field or fields formed the key to the stated table.

- (i) 'racetrack' in the **Races** table.

- (ii) 'colour' in the **Horses** table.

- (iii) 'horse ID' and 'placing' in the **Race Results** table.

(3 marks)

TOTAL: 9 marks

9. A gate to a sports stadium admits one person at a time when a valid ticket is presented. A program was written from the following algorithm to control the gate.

```
BEGIN Gate
  totalCount = 0
  WHILE totalCount < 10794
    read ticket
    IF ticket is valid THEN
      . . . . .
      open gate to admit person
    END IF
  END WHILE
END Gate
```

- (a) Explain the difference between a pre-test loop and a post-test loop.

(1 mark)

- (b) Write the pseudocode to increment the value of **totalCount** by 1 in the space provided by the dotted line in the algorithm. (1 mark)

- (c) State the maximum number of people that this algorithm will allow into the sports stadium.

(1 mark)

- (d) Circle the line of pseudocode that inputs data into the algorithm. (1 mark)

- (e) Explain how the admission of people into the sports stadium would change if the line **END IF** was placed before the line **open gate to admit person**.

(1 mark)

TOTAL: 5 marks

SECTION 1 (Questions 10 to 16)

(71 marks)

Answer ALL questions in this section in the spaces provided after each question. You should spend approximately 85 minutes on this section. The allocation of marks is shown in brackets at the end of each part of each question.

10. Cailin buys a portable MP3 player that can store and play digital music files. The type of storage used by the MP3 player could be flash, optical, or magnetic.

(a) Outline *one* advantage and *one* disadvantage of *each* of the following forms of storage.

(i) Flash.

Advantage: _____

Disadvantage: _____

(ii) Optical.

Advantage: _____

Disadvantage: _____

(iii) Magnetic.

Advantage: _____

Disadvantage: _____

(3 marks)

(b) Cailin records a 3-minute song as an MP3 file at the rate of 128 000 bits per second.

(i) Calculate the size of this MP3 file in megabytes.

(3 marks)

(d) Cailin stores an illegal copy of a digital music file in her MP3 player.

Describe how Cailin could have obtained this illegal copy. Explain why this copy is illegal.

(2 marks)

TOTAL: 16 marks

11. Dianne has heard that it is possible to gain an information technology qualification called the ICLU through online learning and testing. In order to study for this qualification, Dianne must first connect her home computer to the Internet.

(a) Explain *one* advantage of online learning for Dianne.

(1 mark)

(b) Outline *one* method that Dianne could use to protect her computer from being accessed by another Internet user.

(1 mark)

(c) Outline the packet-switching protocol that Dianne's computer uses to exchange data with other computers.

(2 marks)

(d) Dianne types the address `http://www.iclu.com.gl/index.html` into her web-browser to view the home page of the ICLU website.

Explain how the Internet service that Dianne is using works. Use the following terms in your answer: html, http, web-browser, web server.

(4 marks)

- (e) Before Dianne can access the online learning content, she must log on to the ICLU website.

Describe the flow of data that occurs as she successfully logs on.

(2 marks)

- (f) The data that Dianne's computer transmits in the log on process can be at risk.

Describe *two* different methods that can be used to protect this data when it is in transit and when it is stored at the ICLU website.

Method 1 (for data in transit): _____

(2 marks)

Method 2 (for data when stored): _____

(2 marks)

- (g) Describe how the ICLU website can use a number of interactive web pages to test Dianne, record her results, and determine whether or not she passes the course.

(4 marks)

- (h) Explain how current technologies could be used to determine that it is actually Dianne who is doing the online test.

(2 marks)

TOTAL: 20 marks

12. A database to store recipes contains the following two tables that need to be related. A recipe has many ingredients and an ingredient can be used in many recipes.

Ingredients
<u>ingredient ID</u>
ingredient description

Recipes
<u>recipe ID</u>
name
vegetarian
instructions
time to prepare
number served
type of dish

ingredient ID: underlined field(s) are the table's key
 1 \xrightarrow{m} represents a one-to-many relationship

(a) Resolve the relationship between the **Ingredients** and **Recipes** tables by creating a third table.

Your solution should show all necessary fields, links, and relationships. (5 marks)

(b) *At least one* non-ID field that is not present in the **Ingredients** and **Recipes** tables should have been added to this third table.

Explain why you have added this field or these fields.

 _____ (1 mark)

(c) Does this third table need a key?

If not, explain why. If yes, justify your choice of field or fields in the key.

 _____ (1 mark)

- (d) You have just returned from a shop with some prawns and you have only 30 minutes to prepare a dish for the evening meal.

Complete the following structured query to find and display a suitable recipe.

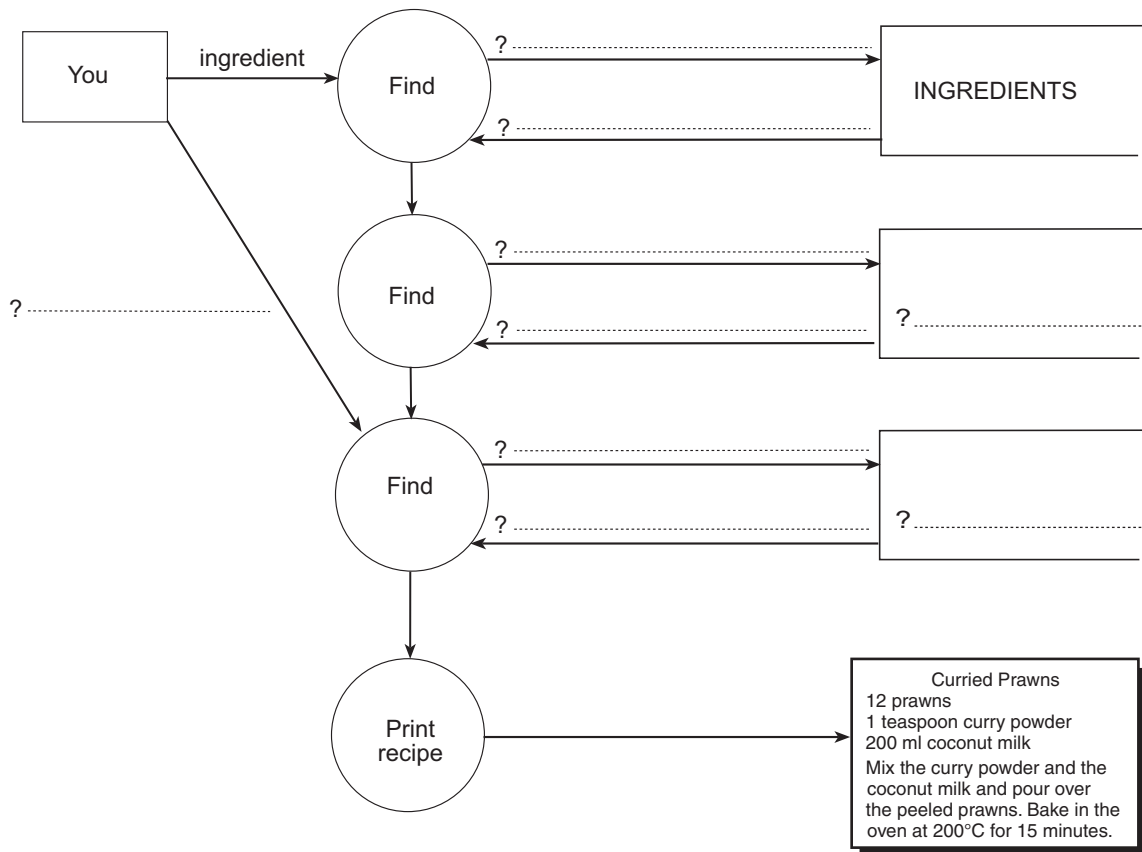
SELECT _____

FROM _____

WHERE _____

(4 marks)

- (e) Complete the following data-flow diagram for producing this recipe by using your completed table relationship diagram to write the required *table name* or *field name(s)* next to each question mark (?).



(6 marks)

TOTAL: 17 marks

13. The number of carriages on a tourist train is calculated by the following algorithm. Each carriage can seat six people. The seats are booked by travel agents. Each travel agent is limited to booking twenty seats on a train.

```
Begin Train
  Initialise
  REPEAT
    Bookings
  UNTIL agent = 'zzz'
  Results
End Train

Begin Initialise
  count = 0
  total = 0
End Initialise

Begin Bookings
  read agent
  read number
  IF number ≤ 20 THEN
    Process
  ELSE
    Error
  END IF
End Bookings

Begin Process
  count = count + 1
  display number 'seats for ' agent
  total = total + number
End Process

Begin Error
  display 'booking not accepted'
End Error

Begin Results
  display count 'agents booked'
  display total 'seats booked'
  cars = (total ÷ 6) rounded up to the next whole number
  display cars 'carriages needed'
End Results
```

- (a) Draw a circle around all lines in the algorithm that comprise *each* of the following control structures. Write the name of the control structure next to each circle.

(i) Selection.

(ii) Iteration.

(2 marks)

- (b) State whether the following variables are global or local.

agent _____ **cars** _____ (1 mark)

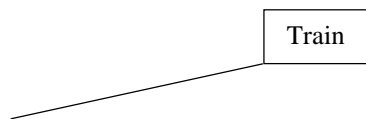
(c) Desk check the algorithm on the page opposite using the following test data:

Jet Tours, 8, VIP Tours, 30, City Travel, 6, zzz, 0

<i>count</i>	<i>total</i>	<i>agent</i>	<i>number</i>	<i>cars</i>	OUTPUT

(7 marks)

(d) Complete the following structure chart of this modular algorithm. Show the flow of data between the modules *only* for the variables *number* and *agent*.



(6 marks)

(e) The following line in the Results module causes an incorrect result to be displayed:

`display count 'agents booked'`

(i) Identify the type of error that causes this incorrect result. Explain your answer.

(ii) Modify the algorithm so that the error does not occur.

(2 marks)

TOTAL: 18 marks

SECTION 2 (Questions 14 to 16)

(30 marks)

Read Questions 14, 15, and 16 carefully, then choose ONE question. Write a structured response to the question of approximately 500 words on pages 14, 15, and 16 of this question booklet. You should spend approximately 35 minutes on this section. The mark allocation below is a guide to the depth of discussion needed. Credit will be given for clear, well-expressed answers that are well organised and relevant to the question.

14. Read the following extract.

Self-diagnosis — good or bad?

Jack notices a lump on his hand. He has been told that a wide range of medical information that is available on the Internet may help him to find out what is wrong with his hand.

Discuss the impact of medical information being available on the Internet.

Refer in your discussion to each of the following points and relate all facts to the situation above:

- The hardware and software needed to access information on the Internet. (4)
- The features of the World Wide Web that enable information to be accessed easily. (6)
- How a search engine enables Jack to locate the medical information he is looking for. Include a description of the flow of data that occurs. (6)
- The availability and accuracy of medical information stored on the Internet. (7)
- The advantages and disadvantages to Jack of having access to this medical information. (7)

15. Read the following extract.

Are banks safe?

Forget about bank robbers brandishing guns and hiding behind masks! These days bank robbers are more likely to use a computer to steal money. When a bank's computer system is hacked into, there is no physical evidence of a break-in or of money being stolen. However, when checking the balance of a bank account, a customer can discover that there is not as much money in the account as there should be.

Discuss the statement: 'Computers have changed the way in which banks can be robbed'.

Refer in your discussion to each of the following points and relate all facts to the situation above:

- The people who could use a computer to steal money from a bank account. (7)
- The hardware and software needed to hack into a bank's computer. (5)
- The ease with which hackers can gain access to bank accounts. (5)
- Methods of protecting data from hacking. (6)
- The impact of hacking on individuals, banks, and the community. (7)

16. Read the following extract.

Plagued by spam

Spam is more than a nuisance on the Internet. It can seriously interfere with the operation of services such as those provided by a computer network. Spam, in effect, takes resources away from people who use the Internet and Internet service providers without authorisation.

Discuss the impact of spam on people who use the Internet.

Refer in your discussion to each of the following points and relate all facts to the situation above:

- What spam is, what it contains, and who might send it. (5)
- How a person who sends spam can find out who to send spam to. (5)
- The problems caused by spam for people who use the Internet. (8)
- How people who use the Internet can prevent their computer from receiving spam. (7)
- The difficulties in reducing spam on the Internet. (5)

