INFORMATION SYSTEMS

Written examination

Friday 11 November 2005

Reading time: 11.45 am to 12.00 noon (15 minutes)
Writing time: 12.00 noon to 2.00 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of questions</th>
<th>Number of questions to be answered</th>
<th>Number of marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>B</td>
<td>17</td>
<td>17</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, an approved graphics calculator (memory cleared) and/or one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied
- Question and answer book of 22 pages with a detachable insert containing a case study for Section B in the centrefold.

Instructions
- Remove the insert containing the case study during reading time.
- Write your student number in the space provided above on this page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.
SECTION A – Short-answer questions

Instructions for Section A
Answer all questions in the spaces provided.

Question 1
Select the correct term (bits per second, bytes per second, hertz, gigs) to complete the following sentence.
The clock speed of a CPU is measured in _________________________________.
1 mark

Question 2
To protect an organisation from an external hacker, every packet of data sent between the organisation’s intranet and the Internet should pass through a _________________________________.
1 mark

Question 3
The process of converting a message into meaningless text for security is called _____________________.
1 mark

Question 4
Consider this list of terms.
• system support documentation
• parallel conversion
• cost
• usability
• project management
• testing techniques
For each of the following statements select the correct term from the list above.
   i. This could be tested when evaluating the performance of a system.

   ______________________________________________

   ii. This is used to monitor tasks and assign resources.

   ______________________________________________

   iii. This is a method used when implementing a new system.

   ______________________________________________

1 + 1 + 1 = 3 marks
**Question 5**
A company located in a large Victorian regional town wants to set up a global online purchasing website. A local Internet service provider (ISP) can host this website for $40 per month. Another ISP, located in India, is offering a similar service for $30 per month.

Outline **three** factors that should be considered before an ISP is selected.

Factor 1

Factor 2

Factor 3

3 marks

**Question 6**
Once installed, a new system undergoes acceptance testing.

State the main purpose of acceptance testing.

1 mark

**Question 7**
A travel agency intends sending a one page newsletter every 2 months to its international customers. To save costs, the agency is considering sending the newsletter via email rather than printing and mailing it. Apart from the cost, **describe two** possible factors that will need investigation before this plan is put into practice.

Factor 1

Factor 2

2 marks
Question 8
A company has employed a systems analyst to analyse its current system.
Briefly describe what the company would expect to receive at the end of this analysis.

Question 9
Briefly explain what is meant by the term ‘bandwidth’.

Question 10
A network operating system can provide administrators with the ability to control levels of access to the file server. Outline why an administrator would make use of this capability.
Question 11
The team leader of a programming project has created a PERT chart to help manage the project. A section of the chart is shown below.

Use this chart to answer the following.

a. Identify **two** tasks that can be performed at the same time.

b. List **all** the tasks that lie on the critical path in this section.

c. What is the minimum number of days that this section of the project can be completed in?

Question 12
To successfully network computers a protocol must be used. What is meant by the term ‘protocol’?
Question 13
For the algorithm below, state the values of Total and Number that would be printed.

Start

Number \( \leftarrow 2 \)
Total \( \leftarrow \) Number

While Number \( \leq \) Total

\begin{align*}
\text{Total} & \leftarrow \text{Total} + \text{Number} \\
\text{Number} & \leftarrow \text{Number} \times \text{Number}
\end{align*}

End While

Print Total, Number

End

Total

Number

2 marks

Question 14
Read the following extract.

Are banks safe?

Bank robbers using guns and masks are now a thing of the past. They are far more likely to use a computer to steal money. Using a computer to access bank systems means they leave no fingerprints or physical proof of the robbery. The first warning could be when a careful customer discovers there is less money in a bank account than was expected.

Outline a strategy that banks should use to reduce the possibility of electronic theft.

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________

3 marks

Total 25 marks
SECTION B – Case study

Instructions for Section B

Answer all questions in the spaces provided.
Remove the case study insert and read all the information provided before you answer these questions.
All answers must refer to the case study.

Question 1

Some of the concerns that the hotel management have about the existing system are listed below. Identify each concern as an economic, social or technical factor prompting change.

<table>
<thead>
<tr>
<th>Concern</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>People do not like to line up and wait to book in.</td>
<td></td>
</tr>
<tr>
<td>The hotel often has desk staff waiting with little to do until a rush comes.</td>
<td></td>
</tr>
<tr>
<td>The current system has been known to cause double bookings and reject bookings when space is available.</td>
<td></td>
</tr>
<tr>
<td>Many hours need to be spent each day processing bookings and admissions.</td>
<td></td>
</tr>
</tbody>
</table>

4 marks

Question 2

Manuel, the systems analyst, has been interviewing staff about the existing Reservation and Billing System. To get a complete understanding of the current system he has started creating a context diagram, a data flow diagram, and a data dictionary, although none are complete. They are shown in the case study insert.

a. Identify the process that produces the data flow ‘Guest’.

b. Identify the data flow that contains the data element ‘Room_type’.

c. Identify the data store from which the process ‘Register Guest’ obtains the room number.

d. Two data flows appear in the data flow diagram that should also be shown in the context diagram. Identify one of these data flows and state to which entity it should be connected.

Data flow

Entity

2 marks
**Question 3**
The automated reservation section is being designed for the proposed new system. This will allow guests to access the hotel’s website and make a reservation from anywhere in the world. Guests will then get immediate confirmation of their reservation.
The existing file server will host all applications including the website which means it will have to be upgraded. The system designer, Basil, has chosen to keep the current 32-bit operating system and is now considering which of the following hardware components should be upgraded.
A. main memory from 512 MB to 1024 MB
B. processor from 32-bit to 64-bit
C. video card from standard to 3-D
Which choice (A., B., or C.) will have the most impact on the server’s overall performance? Justify your answer by comparing the three choices.

Choice ________________________________________________________________

Justification ___________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

4 marks

**Question 4**
People will access the hotel’s new online reservation system using the Internet. Therefore Basil has decided that the system should have the best available firewall. Because this firewall will be very expensive, he has chosen to save money by not purchasing anti-virus software.
Explain why this is not a good decision.

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

2 marks
Question 5
The proposed new system (see floor plan in case study insert) will also have registration booths located in the hotel’s foyer. Manuel has suggested that two registration booths will be needed. Guests will be able to use these booths by themselves to

- register their arrival at the hotel
- select a room
- collect an electronic room key
- pay for the room with a credit card.

Each registration booth will have its own computer that will need to be connected to the hotel’s file server. Which method of communication – **cable** or **wireless** networking – would you recommend? Justify your choice by comparing **two technical characteristics** of each method.

<table>
<thead>
<tr>
<th>Method of communication</th>
<th>Technical characteristic 1</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical characteristic 2</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 marks
Question 6
Manuel has employed a programmer, Polly, to write the registration program. The program will require the guests to follow these steps.

- Select the language to use, for example: English, Chinese, German.
- Indicate whether they have already made a booking.
- Enter their name. If they already have a booking, it will be retrieved from the database.
- Select the type of room they wish to use from the choice of 1, 2 or 3.
- Indicate how many nights they wish to stay in the hotel.
- Pay the amount calculated by inserting a credit card after which they will receive a printed receipt, a room number and an electronic key with a map of where the room is situated.

The program will then close.

Manuel has asked Polly to provide some samples of the user interfaces for the registration program.
She has been asked to allow for a number of different types of input devices.

a. Here is the opening screen of a program that could be used with a touch screen.

Manuel is satisfied with the look of the screen, but it has a major design fault.

i. Identify the major fault.

ii. Suggest how this fault could be corrected.

1 + 1 = 2 marks
b. Assuming the user has selected English as the preferred language, the following is a sample of the next screen that could be used with a keyboard.

Manuel is also satisfied with the look of this screen, but it too has a major design fault.

i. Identify this fault.

ii. Suggest how this fault could be corrected.

1 ÷ 1 = 2 marks
c. On a third screen the user is asked to enter a room type. Only an entry of 1, 2 or 3 is acceptable. If any other data is entered, this error message appears.

![Error Message](image)

i. Identify the major fault with this error message screen.

ii. Suggest how this fault could be corrected.

---

1 + 1 = 2 marks

**Question 7**
The Hotel Manager, Sybil, suggests that some type of user guide is required to assist guests when using the registration booths. Manuel has the following two choices.
- a small poster on the wall next to the booths
- a help option with online instructions as a part of the registration program

a. Describe **one** advantage of using the poster on the wall.

---

1 mark

b. Describe **one** advantage of providing the online help option.

---

1 mark
Question 8
The diagram below shows the basic architecture of the computer system to be used in the registration booths.

![Diagram of computer system]

a. State the main purpose of the bus in this system.

________________________________________________________________________

________________________________________________________________________

1 mark

b. State one of the main functions of the CPU in this system.

________________________________________________________________________

________________________________________________________________________

1 mark
Question 9
The form of storage in the registration booths is to be decided. Basil is considering storing the small registration program on a ROM-based system, eliminating the need for a hard drive. All the guest data input and selections can be communicated directly to the hotel’s main database.
Describe two advantages of ROM compared with a hard drive for the storage of this program.

Advantage 1


Advantage 2


4 marks

Question 10
Three input devices are being considered for the registration booth: keyboard, mouse or touch screen.
Which input device would you recommend for the registration booth?
Apart from cost, give three reasons to support your choice.

Reason 1


Reason 2


Reason 3


3 marks
**Question 11**

Manuel has drawn up a list of criteria to evaluate the new registration software. From the list below select one term to match the criteria given in the table. Terms listed can be used more than once.

- effectiveness
- efficiency
- reliability
- usability
- maintainability

<table>
<thead>
<tr>
<th>Criteria descriptions</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>The hotel staff must be able to add extra room categories and change pricing.</td>
<td></td>
</tr>
<tr>
<td>The system must not cause a wait of more than 3 seconds to answer any request from the booths.</td>
<td></td>
</tr>
<tr>
<td>Each booth must not be unusable for more than 3 hours per month.</td>
<td></td>
</tr>
<tr>
<td>95% of all guests must be able to use the booth without help.</td>
<td></td>
</tr>
<tr>
<td>The speed of a guest booking into the hotel must be reduced by 30% on average.</td>
<td></td>
</tr>
</tbody>
</table>

5 marks
**Question 12**

The network diagram above shows a layout of the proposed new system. Three components in the diagram are not identified. From the list below select the most suitable component for each and describe its function.

- LAN
- modem
- network card
- router
- server
- switch
- WAN
- workstation

Component 1: _______________________________________________________________________

Function _______________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Component 2: ______________________________________________________________________

Function ______________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Component 3: ______________________________________________________________________

Function ______________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

6 marks
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Question 13
New software for the proposed new system is being developed. One module will calculate the cost of a room. It will follow these rules.

- The basic charge is based on the room type and is stored in a table listing the costs for each type of room for a single night.
- The price is for two people. Each extra person in the room is charged an additional 10%.
- If it is off-peak season a 10% discount is given.

The following algorithm has been developed to calculate the cost of a stay, and print out the total cost.

```
Start
Get Arrival_Date
Get Departure_Date
Get Room_Type
Get Season
Total_Cost ← 0
Cust_Date ← Arrival_Date
Repeat
  Get No_In_Room
  People_Charge ← 0
  If No_In_Room > 2 Then
    People_Charge ← Room_Cost[Room_Type] * (No_In_Room – 2) * 10%
  End If
  Total_Cost ← Total_Cost + Room_Cost[Room_Type] + People_Charge
  Cust_Date ← Cust_Date + 1 {This increases the date by 1}
Until Cust_Date > Departure_Date
If Season = "Off Peak" Then
  Total_Cost ← Total_Cost * 90%
End If
Print Total_Cost
End
```

To test this algorithm you are to use the following data for room costs.

<table>
<thead>
<tr>
<th>Room type</th>
<th>Cost per night</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 standard</td>
<td>100</td>
</tr>
<tr>
<td>2 deluxe</td>
<td>200</td>
</tr>
<tr>
<td>3 luxury suite</td>
<td>400</td>
</tr>
</tbody>
</table>

SECTION B – Question 13 – continued
a. Test the algorithm and complete the following test table by determining what will appear in the ‘Expected printout’ and ‘What is printed’ columns.

<table>
<thead>
<tr>
<th>Test</th>
<th>Room type</th>
<th>Arrival date</th>
<th>Departure date</th>
<th>Number of people</th>
<th>Season</th>
<th>Expected printout</th>
<th>What is printed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>21/01/2005</td>
<td>22/01/2005</td>
<td>4</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>14/01/2005</td>
<td>16/01/2005</td>
<td>2</td>
<td>Off Peak</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 marks

b. One line in the algorithm contains a logic error.
   i. Identify that line by writing it out in full.

ii. Explain how this error can be corrected.

1 + 1 = 2 marks

c. i. Identify and explain a second logic error in the algorithm.

ii. Explain how this error can be corrected.

1 + 1 = 2 marks

d. From the algorithm, complete the following table.

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Type of variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total_Cost</td>
<td></td>
</tr>
<tr>
<td>Arrival_Date</td>
<td></td>
</tr>
<tr>
<td>Room_Cost</td>
<td></td>
</tr>
<tr>
<td>Season</td>
<td></td>
</tr>
</tbody>
</table>

4 marks
Question 14
Hotel Torquay wants to prevent other hotels from using their new system. Polly has agreed to sell all rights of the software to the hotel. She is not concerned about losing her rights to the software. She thinks that as the programmer she can just change a couple of lines of code and it will become a new program that she can sell again. Hotel Torquay has advice that this is wrong.
Discuss this conflict of opinion.

3 marks

Question 15
Manuel is thinking of automating the proposed new system further by contracting the backup procedure out to an Internet-based backup and archiving company. The hotel would send a copy of all its data files over the Internet to this company for backup storage. Manuel has been given the names of two highly professional companies that offer this service.
Apart from the cost of this service, discuss two important factors that Manuel should investigate before signing a contract with either company.

Factor 1

Factor 2

4 marks
Question 16
When guests have problems with the new system they will report these to the hotel front desk. Identify, from the following list, the person who is responsible for correcting each of the problems given below. Give a reason for your answer.

• programmer (Polly)
• systems analyst (Manuel)
• technicians
• system designer (Basil)
• hotel manager (Sybil)

i. Customers’ accounts contain the correct room details and costs, but have incorrect totals.

Employee _______________________________________________________________________

Reason _______________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

ii. After two months the registration booths stopped issuing room keys to guests.

Employee _______________________________________________________________________

Reason _______________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

iii. Whenever both registration booths are used at the same time the file server crashes.

Employee _______________________________________________________________________

Reason _______________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

6 marks
Question 17
At the end of the registration procedure the registration booths supply each guest with an electronic card that will act as a room key. Every time a room is booked the room card is issued with a different code as a security measure. The room will only unlock from the outside if the room card has the current code. If the hotel system fails, guests will not be able to enter their rooms. As a result the hotel has insisted on a system down time (time system is not working) of less than 60 seconds.

Describe a strategy that could be used to evaluate whether the system meets the down time requirement of 60 seconds.

3 marks
Total 75 marks
Existing system

The Hotel Torquay is a busy international hotel. It has three types of room available for its guests.
Type 1: standard
Type 2: deluxe
Type 3: luxury suite

The hotel uses two separate information systems to manage its business.

Reservation and Billing System

This system takes requests from people wishing to stay at the Torquay, reserves a room for them, and then produces their account for payment. The Torquay’s guests can make room reservations at the hotel’s reception, over the phone or from anywhere in the world by email. Reception and phone requests are dealt with manually, at the time the request is made, by hotel staff using the computer system. Email requests are dealt with in two stages.

• When the system’s email server receives an email it automatically sends a reply to acknowledge receipt of the email.
• The email is placed into an ‘email reservations’ mailbox; the mailbox is checked by hotel staff once a day and they make the appropriate reservations and send confirmation emails.

Room Management System

The functions of the Room Management System include managing guests’ use of the minibar (a small fridge stocked with food and drink for use by guests at a cost) and the creation of room keys for guests. Room keys are plastic cards with the room number magnetically encoded on them. Guests enter their room by swiping the card through a card reader which is located beside the door of the room. The card reader is manually programmed to recognise its own room number and is not attached to any other computer. Data from the Room Management System is manually transferred to the Reservation and Billing System when required.

Problems with the existing system

Recently there have been an increasing number of problems developing at the front desk. At busy times, such as immediately after the arrival of an international flight, there have been long queues keeping newly arrived guests waiting to register. Many guests have complained about staff making errors in allocating room keys. Rooms have been double booked; and reservations have been lost from the email reservations mailbox.
**Proposed new system**

Management have investigated the problems and believe that it is not economical to increase the number of staff on duty for these short times. They have decided to investigate setting up a fully automated Reservation, Registration and Roomkey System (RRRS).

This new system will provide the following services.

- Guests can make their own reservations via the Internet.
- Guests can make phone reservations.
- Guests can register and pay at the front desk.
- Guests can register and pay using the new registration booths.
- Electronic room keys are personalised to increase security for guests.

A diagram showing the RRRS has been drawn below.

Diagram of the layout of the foyer of the hotel showing the new registration booths in the proposed new system
Additional information for Question 2

data dictionary

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accom</td>
<td>Guest_id + Room_number + Arrival_date + Departure_date + Request_date +</td>
</tr>
<tr>
<td></td>
<td>Services_used + Bar_costs</td>
</tr>
<tr>
<td>Confirm</td>
<td>Reservation_request + Yes_No + ( Cost )</td>
</tr>
<tr>
<td>Guest</td>
<td>Guest_id + Guest_name + Guest_contact_details</td>
</tr>
<tr>
<td>Minibar_data</td>
<td>Room_number + Bar_costs</td>
</tr>
<tr>
<td>Request</td>
<td>Guest_name + Guest_contact_details + Arrival_date + Number_of_nights</td>
</tr>
<tr>
<td>Reservation</td>
<td>Guest_id + Room_number + Arrival_date + Departure_date + Request_date</td>
</tr>
<tr>
<td>Room</td>
<td>Room_number + Room_name + Room_type + Number_of_beds + Unavailable_dates</td>
</tr>
</tbody>
</table>