Victorian Certificate of Education
2004

STUDENT NUMBER

Letter

Figures

Words

INFORMATION SYSTEMS
Written examination

Friday 12 November 2004

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

Section	Number of questions	Number of questions to be answered	Number of marks
A	13	13	25
B	16	16	75
			Total 100

- 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 18 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 electronic communication devices into the examination room.

SECTION A – Short-answer questions

Instructions for Section A

Answer **all** questions in the spaces provided.

Question 1

During which stage of the Systems Development Life Cycle are small changes made to the new or modified system to correct minor problems?

_____

1 mark

Question 2

Identify each of the following data sources as **primary** or **secondary**.

  i. The technical documentation of a software program

   _____

  ii. The error log of an information system

   _____

2 marks

Question 3

The following storage units are listed in order of increasing size.
Fill in the missing item.

bit, byte, _____, megabyte, gigabyte

1 mark

Question 4

Name one type of tool that would be used to manage and keep track of resources within a project.

_____

1 mark

Question 5

Two computers on a LAN were assigned the same IP address. Give one reason why this is a problem.

_____

_____

1 mark

Question 6

From the following storage media,

- 650 Mb CD-ROM
- 250 Mb Zip disk
- 9 Gb removable hard drive
- 21 Gb magnetic tape

state the best storage device for each of these situations.

   i. For distribution of a software package of approximately 500 Mb

_____

   ii. For backing up a database of 10 000 000 records of 2 Kb each

_____

<div align="right">2 marks</div>

Question 7

A system analyst is asked to produce a set of data-flow diagrams and a data dictionary for a new information system.

What is the purpose of a data dictionary?

_____

_____

<div align="right">1 mark</div>

Question 8

This algorithm calculates the total cost of a group of products.

```
BEGIN
    Total_Cost ← 0
    Code ← 0
    WHILE there are items to be processed
            INPUT Product_Cost [Code]
            Total_Cost ← Total_Cost + Product_Cost [Code]
            Code ← Code + 1
    ENDWHILE
    OUTPUT Total_Cost, Code
END
```

From the above algorithm

a. write the name of an array.

_____

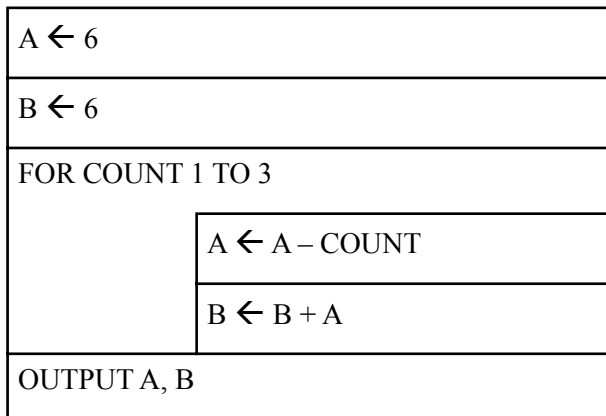<div align="right">1 mark</div>

b. write the name of another variable.

_____

<div align="right">1 mark</div>

Question 9

For the following Nassi-Schneidermann diagram, state the final value of A and the final value of B.

| A ← 6 |
| B ← 6 |
| FOR COUNT 1 TO 3 |
| A ← A – COUNT |
| B ← B + A |
| OUTPUT A, B |

A = _____

B = _____

2 marks

Question 10

Six different types of system software are listed below.
- workstation operating system
- anti virus software
- firewall
- device driver
- network operating system
- web browser

From the list, select the most appropriate system software for each of the following functions.

Function	**Suggested system software**
Provide communication to peripherals	
Verify user network passwords	
Change user's screen saver	

3 marks

Question 11

To evaluate the performance of a new system, there are plans to measure the time taken to complete a backup of the system.

a.   Is this a measure of efficiency or effectiveness?

_____

1 mark

b.   Justify your answer.

_____

_____

_____

2 marks

Question 12

**Buy Now
TravelFriend Notebook**

Features include:
Celeron 2.5 Mhz, 256 Mb, 40 Gb,
DVD/CDRW, 56K, W/less LAN,
touchpad, MS XP Home

A work friend shows you the advertisement above and asks you the following questions.

a.   Which hardware component does 256 Mb refer to?

_____

1 mark

b.   Which hardware component does 40 Gb refer to?

_____

1 mark

c.   What does this notebook use to connect to a network?

_____

_____

1 mark

d.   Apart from using a network connection, how could a backup of the data files be completed?

_____

_____

_____

1 mark

Question 13

Local Edge, a knife supplier in Victoria, wants to expand its mail-ordering system to a worldwide market by setting up a web site with an online ordering facility.

Briefly outline **one** advantage and **one** disadvantage of this organisation operating in a global environment.

Advantage

_____

_____

Disadvantage

_____

_____

2 marks

Total 25 marks

END OF SECTION A
TURN OVER

SECTION B – Case study

Question 1

Stephen is the system analyst appointed by the Hospital Board. In his analysis of the existing system he needs to acquire data about the data-entry and batch-processing procedures.

Describe how he could acquire primary data about the following.

i. Number and type of data-entry errors

_____

_____

ii. Time taken to complete the data entry and batch processing each day

_____

_____

2 marks

Question 2

a. What type of network topology is being used in the existing system?

_____

1 mark

b. Describe **two** advantages of the proposed network topology described in the case study compared with the existing network topology.

Advantage 1 _____

_____

_____

_____

Advantage 2 _____

_____

_____

_____

4 marks

Question 3

During his analysis Stephen has identified the following input and output.

• When patients are admitted to the hospital they provide their personal details including their relevant medical history.

• When patients are discharged from the hospital they receive a bill, make a payment and are issued with a receipt.

• This hospital provides data to the Health Department about the statistics of all patients admitted to the hospital (their illnesses, drugs used and the length of their stay).

In the following context diagram, label both the entities and all their data flows.
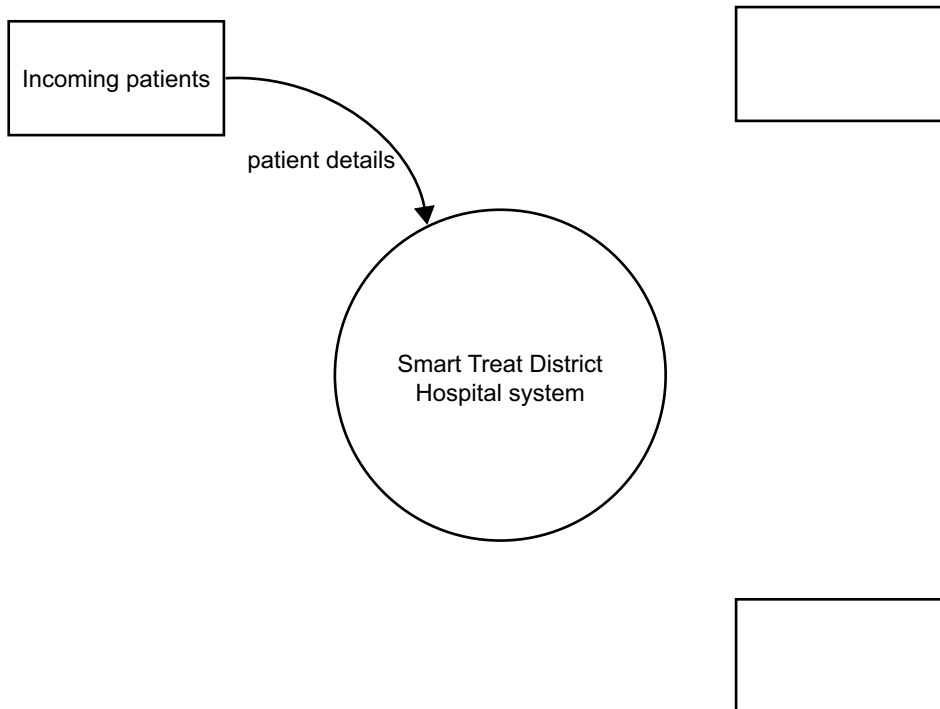
6 marks

Question 4

The existing hospital patient database is stored in a single serial file sorted by patient name. The system analyst, Stephen, is considering using new software that can use either serial access files or random access files.

a. Explain, in terms of file structure, why it is difficult to add or modify a record in the existing serial file.

_____

_____

_____

_____

2 marks

b. Explain why field types and field sizes are usually defined before a random access file is created.

_____

_____

_____

_____

2 marks

c. Give **two** reasons why Stephen would recommend the use of random access files.

Reason 1 _____

_____

Reason 2 _____

_____

2 marks

Question 5

It is necessary to decide the specifications for each type of field that will be stored in the database. The software can hold all common types of data fields including text fields (either fixed length or memo), numeric fields (either integer or floating point), date-time field (in a variety of formats), binary fields and Boolean fields.

The home telephone number is to be stored in the form **(09) 9999 9999**. Stephen has decided that the numeric data field is unsuitable and he will use a fixed length text field.

a. Why is the numeric data field unsuitable?

_____

_____

1 mark

b. The default length of the text field is set to 64 characters. Describe an advantage of changing the length for the home telephone number field.

_____

_____

_____

1 mark

c. What should be the length of the home telephone number field?

_____

1 mark

d. What is the most appropriate field type to store the following data?

Data to be stored	Field type
whether the patient is currently admitted	
exact weight in kilograms (for example 72.5)	

2 marks

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Question 6

Patient body temperature is to be entered into a numeric field. Values less than 30.0 or greater than 42.0 degrees Celsius will not be accepted.

The following algorithm has been written to validate the patient body temperature when it is entered.

Begin
   Repeat
           Valid_Temp ← True
           Input Patient_Temp
           If Patient_Temp is numeric then
                  If Patient_Temp <=30.0 or Patient_Temp>=42.0 **Then**
                        Valid_Temp ← False
                        Display Invalid temperature message
                  Endif
           Else
                  Display Invalid characters message
           Endif
   Until Valid_Temp = True
   Validated_Patient_Temp ← Patient_Temp
End

a.   The data below was selected to test this validation routine.
     Use the algorithm to fill in the missing test results.

Test data	Expected results	Actual results (from the algorithm)
29.9	Invalid temperature message Data not accepted	Invalid temperature message Data not accepted
30.0		
37.4	Data accepted – no messages	Data accepted – no messages
42.0		
42.1		

6 marks

b.   Write the whole line of the algorithm containing the errors identified by using the above test data.

_____

1 mark

c.   **i.**   Identify an item of test data to **test another part** of the algorithm.

_____

     ii.   What is this testing?

_____

                                                                                    2 marks

d.   Describe **two** corrections to the algorithm that will enable it to meet the specifications.

_____

_____

_____

_____

_____

_____

_____

                                                                                    4 marks

Question 7

When designing the new system Stephen made a number of choices about the hardware components required. Explain one possible reason for each of these choices for use within the hospital system.

PDAs instead of notebooks

_____

_____

Wireless network access points instead of fixed network points

_____

_____

A **switch** instead of a hub

_____

_____

                                                                                    6 marks

Question 8

Using the Internet, the hospital manager has located a computer hardware supplier in the Philippines that can supply the wireless PDAs and the workstations for a considerably cheaper price than local suppliers. However, in the past, the hospital computer technical staff have used Medisoft, a local hardware and software supplier and have developed a good working relationship with them.

Explain why it would be better for the hospital to use Medisoft, even though it would be more expensive.

_____

_____

_____

_____

_____

_____

_____

3 marks

Question 9

Current privacy laws state that patient data must be kept secure at all times. The hospital manager is concerned that the patient data that is transmitted by the wireless PDAs is not totally secure and therefore does not conform to the privacy laws.

Outline an action to address this concern and describe how this action will solve this problem.

_____

_____

_____

_____

_____

_____

_____

3 marks

Question 10

The hospital manager is worried that the Internet will distract the medical staff, especially during the night shift. He is concerned that they will use it for personal purposes such as banking, shopping and email, or simply surf the Net during working hours.

Apart from reducing the quality of patient care, discuss **two technical** problems that can result from this misuse of the hospital computer system. How can each of these problems be prevented?

Technical problem	Preventative action

4 marks

Question 11

Before using the PDA to record patient observations, each nurse is required to logon to the network with a unique username and password. As a member of the hospital computer help desk, describe **three** important strategies that you could provide to the nurses about the use of appropriate passwords.

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

3 marks

Question 12

Once the new system is running internally, and all the patient data is being collected, the hospital will then need to send data to the Health Department's national database of patient statistics. The data the hospital is required to send will average about 0.5 Gb and must be sent electronically each Monday morning. The local telephone system does not support broadband access but will support the use of a modem with transmission speeds of up to 56 kps.

a. Explain why this is a problem for the hospital.

_____

_____

_____

_____

_____

2 marks

b. Describe one possible solution to this problem and explain why this solution is suitable.

_____

_____

_____

_____

_____

2 marks

Question 13

A large, local company has offered to fund the development of software for the hospital. The software will analyse cancer patient data, their symptoms and response to existing treatments. It is hoped this analysis will assist research into improved treatments. One condition the company requires is that their programmer includes a module unknown to the hospital that will allow the company hidden access to all the hospital's collected data.

The programmer feels uncomfortable with this condition. Discuss why.

_____

_____

_____

_____

_____

_____

3 marks

Question 14

From the case study, some of the major concerns about the old system were

* lack of full patient detail on the electronic system
* the regular occurrence of data-entry errors
* inefficient data-recording procedures
* time taken before access to both new patient data and archived patient data is available.

Select any **two** concerns from the list above and explain how the proposed system will overcome each concern.

Concern 1 _____

Explanation _____

_____

_____

_____

Concern 2 _____

Explanation _____

_____

_____

_____

4 marks

Question 15

Stephen, the system analyst, wants to be certain that the PDAs' software will work as expected with the hospital patient database. The supplier of the PDAs claims to have checked the manuals and has assured Stephen that they will work.

Describe **one** further test Stephen should perform to satisfy his concern.

_____

_____

_____

_____

_____

2 marks

Question 16

Six different types of user documentation are listed below.

- Data-entry manual
- Network system technical manual
- Web site design manual
- PDA users' guide
- Computer operator guide

Select **one** type of documentation needed by **each group** and explain why it is relevant for that group.

Group of users	User documentation	Reason
Nurses		_____ _____ _____ _____ _____ _____
Hospital computer help desk staff		_____ _____ _____ _____ _____ _____
Patient admissions staff		_____ _____ _____ _____ _____ _____

$3 \times 2 = 6$ marks

Total 75 marks

END OF QUESTION AND ANSWER BOOK

CASE STUDY INSERT
Please remove from the centre of this book during reading time.

Existing system

Smart Treat District Hospital is a large country hospital (110 beds) situated approximately 2000 km from Canberra. The hospital uses a small computer network in its administration area for accounts and some patient information.

On admittance to the hospital a patient is given a paper-based form to fill out. The patient provides personal details and any relevant medical history data. A copy of this form is then sent with the patient to the ward. Another copy is left at administration to be batch processed by data-entry personnel. Patient data from these forms are entered and stored in a temporary file on the administration workstation. The patient database is updated from this file twice a day.

In the ward the patient's information is copied by hand onto a chart that is placed at the end of the patient's bed. The data on this chart is updated several times a day. If the patient has been admitted to the hospital before, the nursing staff need to visit the patient records storage area in another building and locate the relevant patient folder.

When the patient leaves the hospital, the patient chart is sent to administration for batch processing. The data-entry personnel enter only selected information from this chart. The paper-based chart is then stored in a patient folder and archived back in the record storage area.

The computer network consists of

- file server to store patient database
- accounts workstation with a printer to process patient accounts
- reception workstation with a printer to handle visitor enquiries and produce patient discharge documents when they leave
- administration workstation with printer to enter patient data. This data is batch processed. The printer is used to print patient statistics as required.
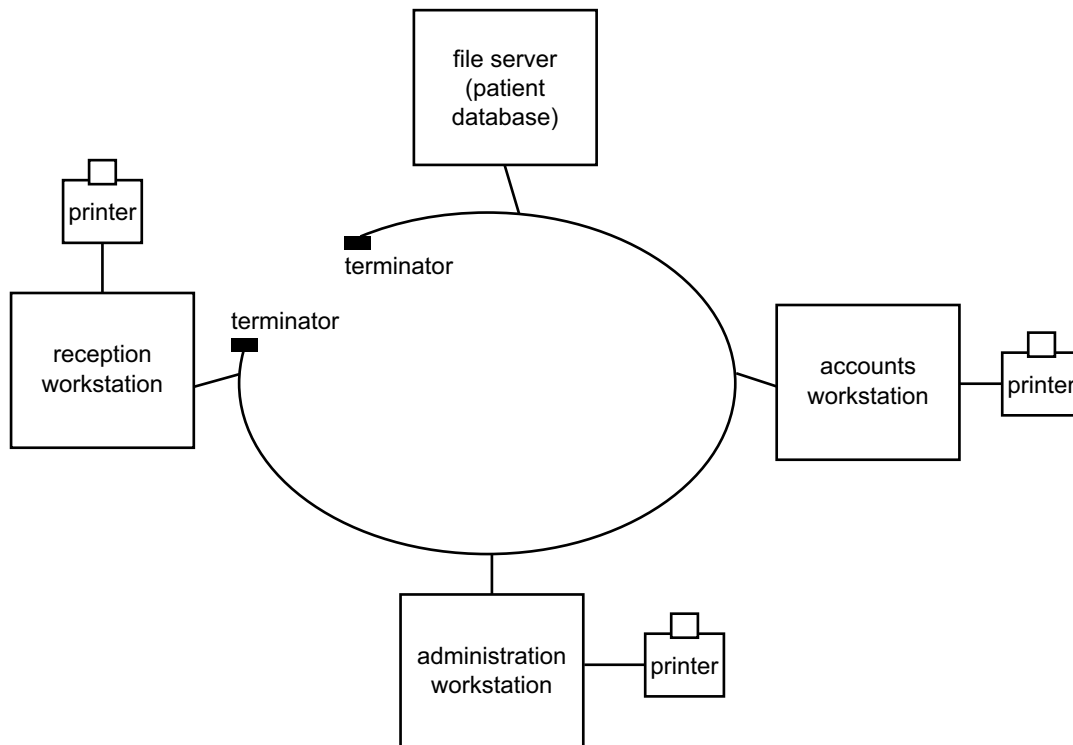
The hospital manager has various concerns about the current hospital information system including the

- lack of security of data
- lack of full patient detail on the electronic system
- regular occurrence of data-entry errors
- inefficient data-recording procedures
- time taken before access to patient details is available
- time taken to retrieve archived patient data.

The National Health Department coordinates and manages hospital funding throughout Australia. They want to collect more relevant data to ensure that appropriate services and funding are provided to every hospital. They also want this data for research into successful treatments and the best use of pharmaceuticals.

Smart Treat Hospital has been selected to trial a new electronic system for the collection, storage and communication of patient data.

Proposed new system

The new system will include these additions to the existing network.

- a workstation at the nurses' desk in each of the six wards
- a small portable device (PDA) for the use of each nurse on duty
- a wireless network access point in each ward
- a printer at each workstation (or in each ward)
- workstations and the wireless network access points connected by UTP CAT 5 cable to a switch connected to the hospital file server

This new information system will have the ability to electronically send data about the number of patients admitted to the hospital, their illnesses, drugs used and length of stay. All patient data will be entered directly onto the hospital patient database in real time. It will include nurses' observations on temperature, pulse, blood pressure and medications. The new hospital software will include data validation on all patient data entered.

Observations will now be entered using the PDAs which communicate using the wireless network. Each workstation will be used by both the doctors and nurses to access the patient database.

END OF CASE STUDY INSERT