Victorian Certificate of Education
2000

INFORMATION SYSTEMS

Written examination

Wednesday 8 November 2000: 11.45 am to 2.00 pm
Reading time: 11.45 am to 12 noon
Writing time: 12 noon to 2.00 pm
Total writing time: 2 hours

QUESTION BOOK

Structure of book

Number of questions	*Number of questions to be answered*
7	7

Directions to students

Materials
Question book of 9 pages.
One or more script books.
An approved calculator may be used.

The task
Please ensure that you write your **student number** in the space provided on the front cover of the script book(s).
This question book contains only one case study. All questions are based on the case study. Answer **all** questions in the script book(s) provided.
There is a total of 125 marks available.
All written responses should be in English.

At the end of the task
Place all other script books inside the front cover of one of the used script books.
You may retain this question book.

CASE STUDY

The Ace Bicycle Company

Manufacturers of Superior Two Wheelers

The Ace Bicycle Company (ABC) builds bicycles. The company uses parts which have been made in other factories. At the moment the company builds a range of standard models.

- mountain bikes
- racing bikes
- touring bikes
- BMX bikes

Each model is made in a range of sizes. The bikes are painted in standard colours. Stocks of each model are stored in the factory.

The company's customers include bike shops and the general public. The order process consists of the following steps.

- customer places order for bike(s)
- details are entered into existing computer in the accounts area
- bike(s) is supplied from stock
- the existing accounts computer prints an invoice. The invoice is given to the customer.

When the stock of a particular model runs low the factory builds a new batch of that model.

Some customers ask ABC to alter the standard models. Sometimes customers want different brakes or different gears. When these alterations are requested the closest standard model has the parts changed according to the customer's specifications. This is a very inefficient process because it requires the removal of parts that have already been fitted, before the new parts can be installed.

In recent years, the bike factory has found that more customers request variations on the standard models. This means that too many bicycles have to be taken apart and rebuilt. As a result, the factory managers have decided to change the way the factory operates. They would like to put in place a production process where

- customer places order for bike(s), specifying which individual parts they want
- each bike ordered is assembled by a bike builder using the parts specified by the customer
- the finished bike(s) is sent to the customer with an invoice.

This new process means that ABC will no longer have to keep finished bikes in stock. It will, however, have to keep much better track of its stock of bike parts. Because of this, ABC decides that it will need a new information system to help manage the new production process.

Question 1

The first step in developing a new system is the process of systems analysis. As part of this process, Fred, the systems analyst, needs to determine facts about the

- operations of the factory
- current information system
- requirements of the proposed system.

These facts include details of

- the existing file structures of the accounting system
- the current procedures for ordering and billing.

a. Give details of **two other** facts that Fred needs to find out about in order to design the new system.

6 marks

b. Describe **two** methods Fred could use to obtain details about **each** of the following.

- the existing file structures of the accounting system
- the current procedures for ordering and billing

Note: this means a total of four different methods (two for each dot point).

8 marks

c. Fred needs to document the information obtained about current procedures for ordering and billing. List **two** tools he could use. Describe the purpose of each tool.

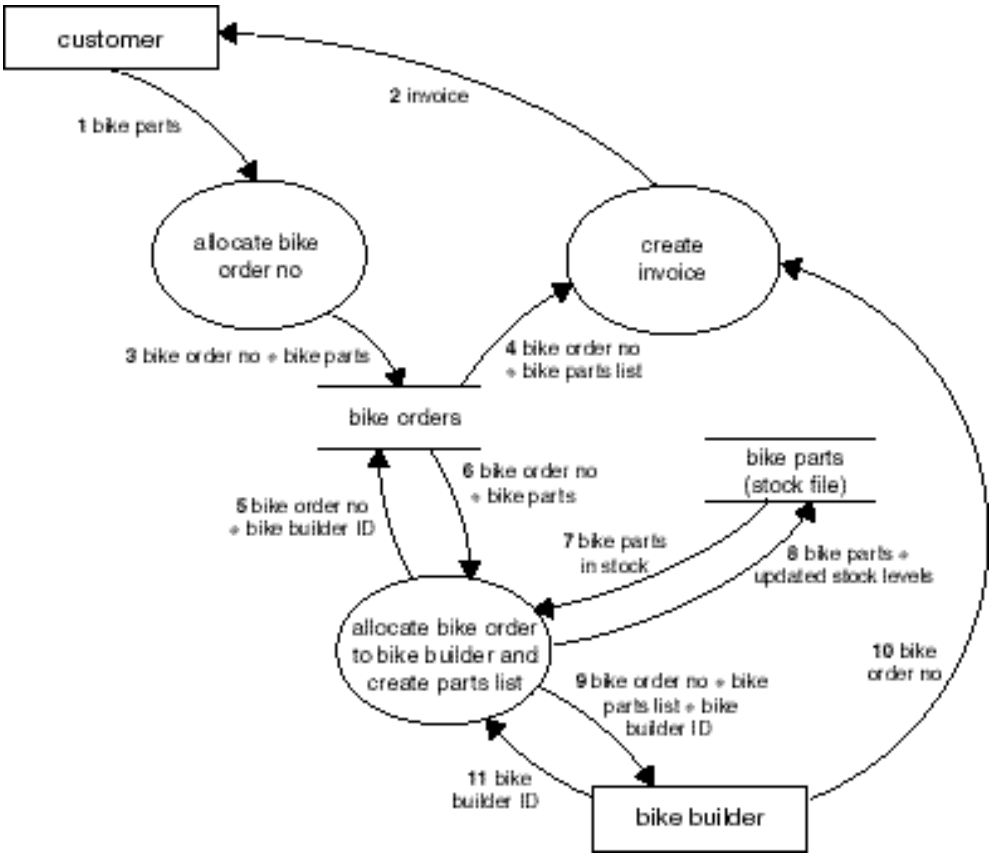
6 marks

Case Study continues

After the analysis, Fred suggests the following system for processing customer orders.

- customer orders a new bike by selecting the parts on a form
- details from the form are entered into a computer system
- the computer system allocates a bike number to each order
- orders can be accepted at the factory (desk orders) or over the phone (remote orders)
- when a bike builder is ready to build a new bike they type their ID into the computer system
- the computer system prints a parts list for the next bike order that does not have a bike builder and for which all parts are available
- the computer system allocates the bike builder to this bike order
- the parts on this parts list are deducted from the bike parts file
- the bike builder gets the parts from the shelves and builds the bike
- when the bike builder finishes a bike they enter the bike order number into the computer system to indicate that it has been completed
- the computer system creates an invoice
- the invoice is returned to the customer

The proposed data flows are shown in the following diagram. The data flows are numbered 1 to 11.



Question 2

The data flow diagram above gives a rough outline of the design of the new system. The 'allocate bike order to bike builder and create parts list' process can be broken down into the sub-processes listed in the table below.

Sub-processes
A. find next bike order for bike to be built
B. determine availability of bike parts for this bike order and update parts file
C. allocate this bike order to bike builder, update bike orders file and generate bike parts list

a. List the data flow number(s) associated with each sub-process A, B and C.

6 marks

The proposed layout of an invoice, that will be produced by the 'create invoice' process, is shown below. The cost of the bike will be calculated from

- the total cost of the parts used
- the cost of labour
- a profit margin.

The customer's details will be obtained from another file. This file will contain customer details (not included in the data flow diagram).

Ace Bicycle Company

Invoice No	**100042**
Total Payable	**$675**
Invoice Date	**20 March 2000**
Total payable by	**20 April 2000**

Mr C Hayes
123 Velodrome Road
Mitcham
VIC 3132

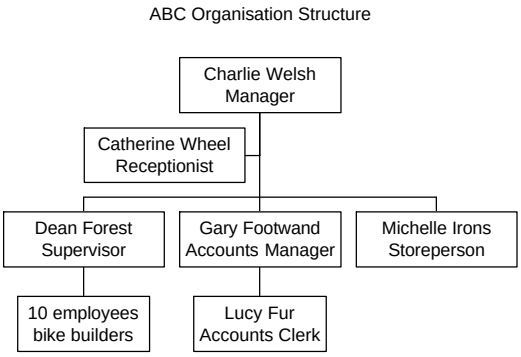
Part No	Description	Quantity	
SF4576	steel frame	1	
AW2354	alloy wheels	2	
SSS7482	stainless steel spokes	72	
HB5319	hydraulic brakes	2	
SG2448	24-speed gears	1	
GS7725	gel seat	1	
SF2007	suspension forks	1	
AHB1414	alloy handlebars	1	
	Total Payable		**$675**

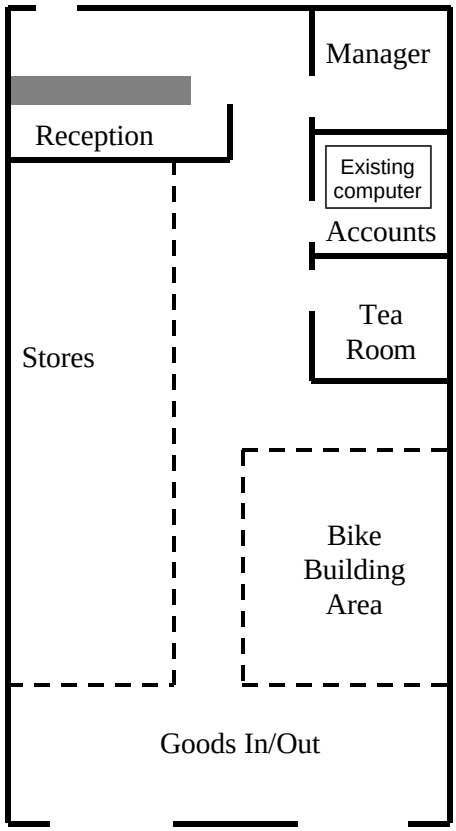
b. What steps will be required in the 'create invoice' process to produce this invoice?
The steps in the 'create invoice' process should include the source of any other necessary data.
You may wish to present your answer in an appropriately structured format.

7 marks

Case Study continues

The diagram on the left (below) shows the people who work at ABC.
The diagram on the right (below) shows a floor plan of the factory.





Question 3

There is an existing computer in the accounts area. Fred has determined that his design will require another three workstations.

a. For each new workstation specify

- who will use the workstation
- where the workstation should be located
- what the workstation will be used for.

The table below shows one possible way to set out your answer.

9 marks

Workstation	Who will use it	Location	What it will be used for
1			
2			
3			

b. Data files, such as the bike parts file, will need to be accessed from more than one of the new workstations. Fred is unsure whether these data files should be

- stored on a separate file-server computer which can be accessed from all the other computers, or
- stored on the workstation where the data is first entered. Each workstation would be configured to allow the other workstations to access its data files (peer-to-peer).

Compare these two options by discussing the advantages and disadvantages.

8 marks

Case Study continues

The parts file in the data flow diagram stores data about the bike parts. Its structure is shown in the table below.

Parts File Structure

Field Name	Comment
Part number	primary key
Description	
Supplier ID	links to supplier in supplier file
Quantity in stock	current quantity in stock
Minimum stock level	smallest quantity needed to make sure this part does not run out before new parts are delivered
Maximum stock level	largest quantity desired in stock

Reordering Process

New stock is ordered at four o'clock each day (this process is not shown on the data flow diagram on page 4). When new parts are required the reorder process sends orders electronically to suppliers. A section of this process decides which parts need to be ordered. This is done by comparing the quantity in stock with the minimum stock level. If the quantity in stock of a particular part falls to the minimum stock level or below, new parts are ordered. This brings the total stock up to the maximum stock level.

Details of the parts required are stored in an Order Item File.

Order Item File Structure

Field Name	Comment
Date ordered	date order was placed
Part number	
Quantity ordered	

Question 4

a. ABC needs to determine values for the minimum stock level and maximum stock level fields. List **four** factors that need to be taken into account when determining these values.

4 marks

The following algorithm is proposed to carry out the reordering process described above.

```
Open Parts File for Input
Open Order_Item File for Output
While NOT End of Parts File
  Read Part_Number, Quantity_in_Stock, Minimum_Stock_Level, Maximum_Stock_Level from Parts File
  If Quantity_in_Stock = Minimum_Stock_Level Then
        Date_Ordered ← System Date
        Quantity_Ordered ← Quantity_in_Stock   Maximum_Stock_Level
        Write Date_Ordered, Part_Number, Quantity_Ordered to Order_Item File
  End If
End While
Close Parts File
Close Order File
```

b. To test this algorithm

design test records that could be inserted into the parts file
explain your choice of values for each of these test records
indicate the expected output to the order file (if any) for each test record.

12 marks

c. Find the errors in this algorithm and explain how to correct them by using a bench test or any other suitable method.

6 marks

TURN OVER

Case Study continues

At present, Lucy, the Accounts Clerk, has the responsibility of backing up the data on the accounts computer every night. She does this using a floppy disk, which is then stored in a locked cupboard in the manager's office.

The manager has suggested that when the new system is installed she could still carry out this task.

The procedure she could follow would be

- at 4 o'clock each day collect one new floppy disk for each computer from the manager's office
- go to each computer and backup the data stored on its hard disk drive
- carefully label each floppy disk and place all of them in the cupboard in the manager's office.

Question 5

Fred (the systems analyst) is not happy with the manager's suggested procedure.

a. List **four** important concerns that Fred might have about this procedure.

4 marks

b. Suggest a better backup procedure, including any new hardware/software that may be needed by your procedure.

8 marks

c. Discuss **two** reasons why your procedure is better than the one suggested by the manager.

6 marks

Question 6

Fred has contracted the Big Yellow Cabling Company (BYCC) to install the electric power and data cabling in the bike factory.

BYCC have estimated that it will take

- two days to lay the required network data cables
- three days to wire up the required power points
- one and a half to two days to set up the computers which includes
  - connecting the new computers to the network
  - connecting the existing computer to the network
  - installing and configuring the required software on all computers.

The factory cannot afford to have its existing computer system out of action during the working week. The manager suggests that the cable laying and wiring could be done during the working week since it will not interfere with the operation of the factory. After the cabling and wiring are complete the computers could be set up during a weekend. The system could be completed by Sunday afternoon, including connecting the existing computer. It would then be ready for Monday morning.

a. Name the changeover strategy that the manager is suggesting.

2 marks

b. Discuss any problems that might arise if this strategy is adopted.

6 marks

c. Suggest another strategy and explain why you think it is better.

8 marks

Question 7

Once the changeover is complete, the continued successful operation of ABC will depend on the reliability of this computerised system. Three possible events which may affect this reliability are

- staff may take files home on floppy disks and bring them back infected with a virus
- one or more computers may break down or be stolen
- there may be an electric power failure or a fire at ABC.

a. List **three** problems that these kinds of events might cause for ABC.

3 marks

b. Describe **three** ways that these kinds of events could affect the people working for ABC.

6 marks

c. List **four** measures that ABC could take to minimise the chances of the system becoming unreliable.

4 marks

d. ABC needs to develop a disaster recovery plan. Describe **three** strategies that should be included in this plan.

6 marks

Total 125 marks

END OF QUESTION BOOK