



JAMES RUSE
AGRICULTURAL HIGH SCHOOL

2013
ACCELERATED HSC COURSE
INTERNAL EXAMINATION

Information Processes and Technology

HSC ASSESSMENT | TRIAL EXAMINATION

General Instructions

- ▶ Reading time – 5 minutes
- ▶ Working time – 180 minutes
- ▶ Write using black or blue pen
- ▶ You may use a calculator
- ▶ You must provide your own writing paper
- ▶ Attach the given cover sheet to your answers
- ▶ Attempt all questions (no optional sections)
- ▶ Mark allocations are provided for each question

Total marks: 125

Section A Pages 2–5

20 marks – Multiple Choice

- ▶ Attempt Questions 1–20
- ▶ Allow about 25 minutes for this section

Section B Pages 6–12

51 marks – Extended Response (Core Topics)

- ▶ Attempt Questions 21–26
- ▶ Allow about 75 minutes for this section

Section C Pages 12–16

54 marks – Extended Response (Option Topics)

- ▶ Attempt Questions 27–31
- ▶ Allow about 80 minutes for this section

SECTION A

Multiple Choice

1. Higher quality and smaller file sizes for multimedia are largely a result of:
 - A. Compression techniques
 - B. Faster processors
 - C. Faster communication links
 - D. Larger storage capacities

2. Which of the following best describes authoring software?
 - A. Create various different media types and compress them in preparation for distribution and display
 - B. Create websites that incorporate a variety of different media types
 - C. Import and combine different media types into a single interactive system
 - D. Develop systems that collect data from users and process this data into information that is displayed

3. Accurate reproduction of an actual world environment is the ultimate aim of:
 - A. Simulations
 - B. Virtual reality
 - C. Artificial intelligence
 - D. Computer games

4. Which of the following would NOT reduce the storage size of a sampled audio file?
 - A. Decreasing sample size
 - B. Decreasing sample rate
 - C. Decreasing number of channels
 - D. Decreasing volume

5. The technology used to determine red, blue and green values with a camera sensor is:
 - A. BAYER filter
 - B. RGB filter
 - C. CMYK filter
 - D. HSB filter

6. Doubling the dimensions and bit depth of a bitmap image will increase its file size by:
- A. 2
 - B. 4
 - C. 6
 - D. 8
7. Which of the following is the most thorough error-checking method?
- A. Parity bit
 - B. Cyclic Redundancy Check
 - C. Checksum
 - D. Repetition code
8. What is the primary purpose of HTML?
- A. To provide secure access to a web page via the world wide web
 - B. To specify how text, graphics and sound are displayed on a web page
 - C. To control access to files when downloading data via a web page
 - D. To transfer a web page from a remote server and display it on a screen
9. Under what conditions would it be appropriate to outsource the development of a new solution?
- A. When the design team does not have the skills to deliver a part of the system
 - B. When the materials required for the system cannot be delivered to schedule
 - C. When the new system does not meet the basic requirements of the client
 - D. When the cost of the new system is not economically feasible
10. Choose which statements are always correct:
- I. Star topologies require the most physical cabling
 - II. Data collisions can never occur in a ring topology
- A. I only
 - B. II only
 - C. Both I and II
 - D. Neither I nor II

11.

line 1 SELECT STUDENTID, STUDENTNAME, MARKS line 2 FROM STUDENT, RESULTS line 3 WHERE STUDENT.Student ID = RESULTS.Student ID and RESULTS.MARKS > 49
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In the above SQL, what does line 2 do?

- A. It specifies the criteria used for data retrieval
 - B. It identifies the fields displayed in the results
 - C. It identifies the tables to be used for data retrieval
 - D. It determines the sequence for the displayed results
12. Which of the following is NOT an advantage of LCDs over CRTs?
- A. Brightness
 - B. Weight
 - C. Size
 - D. Power consumption
13. Though newspapers are now available as online publications, many people still prefer to purchase printed newspapers because:
- A. Printed versions require no electricity or other technology
 - B. Online versions are ergonomically inferior
 - C. The design of printed newspapers is more intuitive for older readers
 - D. All of the above
14. While visiting a website that seels popular surfing movies, Lachlan decided to save an image from the website. Lachlan later used that image as part of a logo for his surfboard business, without permission. How is Lachlan’s action best described?
- A. Breach of privacy
 - B. Misinformation
 - C. Infringement of copyright
 - D. Acknowledgement of sources
15. When designing an expert system, it is best to include objective questions for the user to answer. Which of the following is NOT a reason for this?
- A. Objective questions are easier to answer
 - B. Objective questions are less vulnerable to misinterpretation
 - C. Objective questions are more likely to generate an accurate response
 - D. All of the above

16. Which of the following features of a decision support system is independent of logic?
- A. Explanation mechanism
 - B. Knowledge base
 - C. Database of facts
 - D. Inference engine
17. Which of the following is NOT true of Bluetooth?
- A. It is primarily intended for connecting peripherals
 - B. Enabled devices are visible to other compatible devices in the nearby area
 - C. It can be temporarily deactivated
 - D. It consumes less power than other kinds of connections for the same device type
18. Which of the following RAID levels employs both data striping and data mirroring?
- A. Level 0
 - B. Level 1
 - C. Level 2
 - D. None of the above
19. Which of the following is NOT a weakness of password authentication?
- A. Provide no protection against physical threats
 - B. Only as secure as the users who devise them
 - C. Very difficult to change
 - D. Easy to guess
20. A global company maintains a single database divided up into different sections based on country. This is referred to as:
- A. Data redundancy
 - B. Vertical fragmentation
 - C. Horizontal fragmentation
 - D. Replication model

SECTION B

Extended Answer: Core Topics

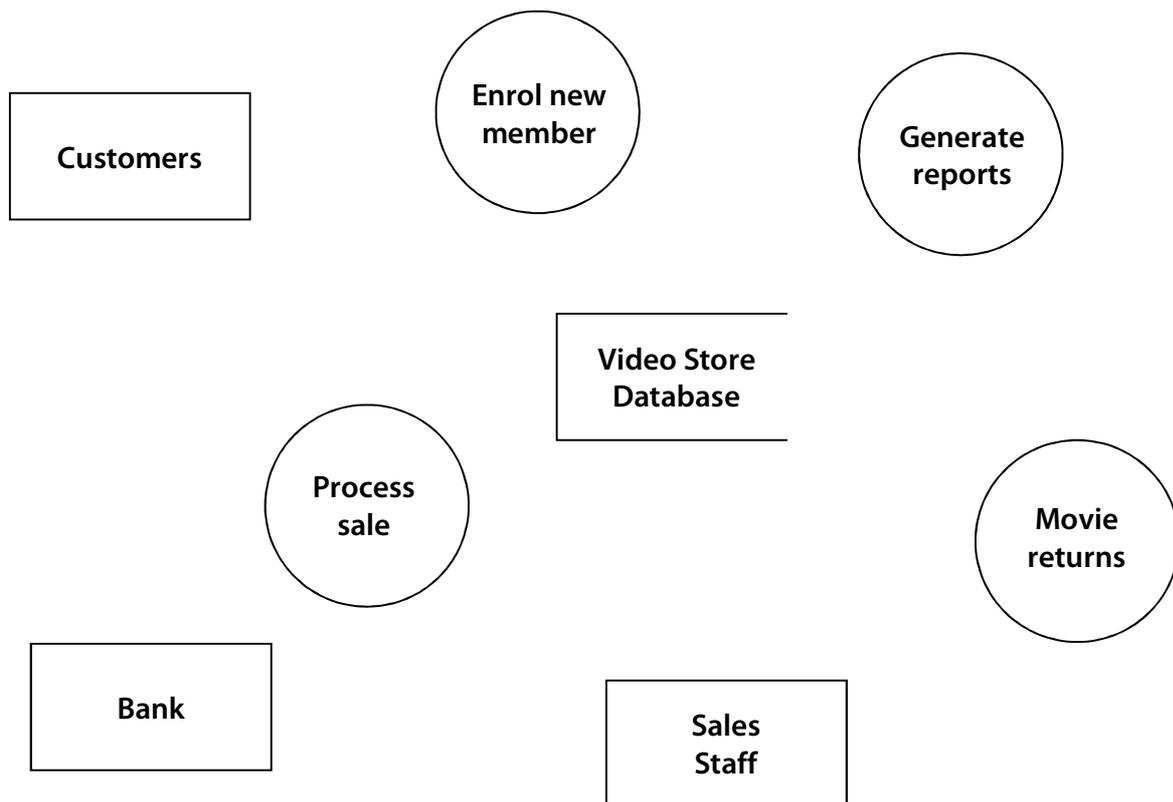
QUESTION 21

[8 marks]

A small video store records details of its customers and the videos and DVDs they have borrowed using vStore – a software application connected to a database. The store has a single personal computer attached to a cash drawer, bar code scanner and printer. The owner of the store uses the computer to generate various financial and statistical reports from the database. The sales staff use the computer when enrolling new members, processing sales and entering returned movies.

The customers are provided with a membership card that includes a barcode representing their membership number. Similarly, each video and DVD has a sticker with a unique barcode. A separate EFTPOS machine is used to process all non-cash payments.

The following incomplete dataflow diagram is an attempt to describe the information system:



- a. Copy the diagram above onto your paper, and complete it by adding labelled dataflows. [4]

- b. Copy the data dictionary below onto your paper, and complete it by including each item [4]
from every dataflow on your completed dataflow diagram.

Dataflow	Data type	Description of purpose
(add as many rows as are required)		

QUESTION 22**[7 marks]**

Louise works for a large department store. She is responsible for maintain records in regard to the loan of items to various departments. Louise currently stores this data in a single Loans table linked to an Employee table she obtained from the IT department.

- ▶ The Employee table includes EmployeeID, LastName and FirstName attributes
- ▶ Each Department has a single supervisor who borrows items on behalf of employees in their department
- ▶ Each employee works within a single department
- ▶ Each item has a label attached with a unique item number

Some of the records in Louise's Loans table are reproduced below.

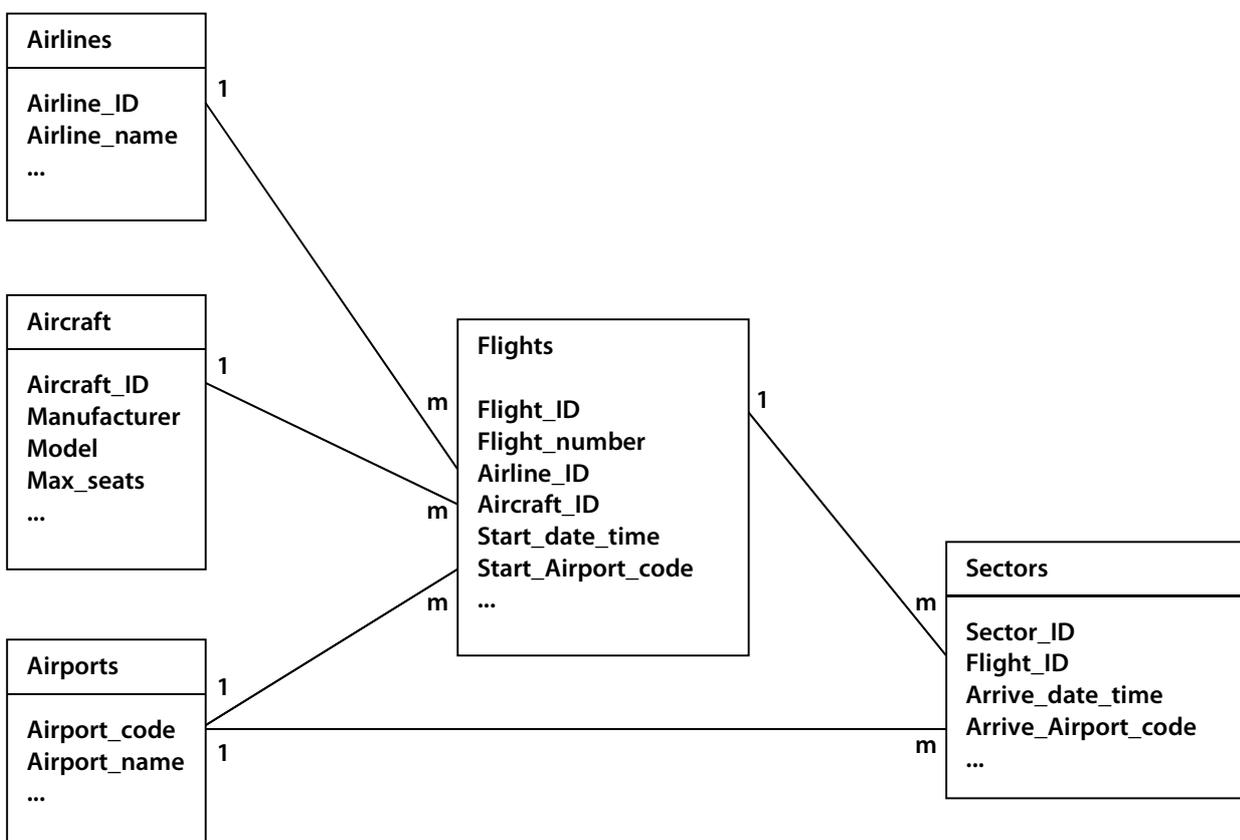
Item Name	Item #	SupervisorID	EmployeeID	Dept. Name	BorrowDate	ReturnDate
Cash register	2341	JWA	FNE	Ladieswear	15/2/05	
Stocktake scanner	6634	MRO	MDA	Electronics	10/5/06	9/6/06
Stocktake scanner	4511	SMI	MDA	Menswear	10/4/05	17/4/05
Laptop computer	2433	SMI	SMI	Menswear	11/8/05	12/2/06
Stocktake scanner	6634	JWA	FNE	Ladieswear	12/6/06	
Laptop computer	1866	JWA	SDA	Ladieswear	18/3/05	21/9/06
Laptop computer	2433	SMI	SMI	Menswear	18/5/06	
⋮	⋮	⋮	⋮	⋮	⋮	⋮

- a. With reference to the sample data above, identify an example of data redundancy and describe problems that could arise as a consequence. [3]
- b. Normalise this relational database into four tables (including the Employee table). [4]
Indicate all necessary relationships, primary keys and foreign keys.

QUESTION 23

[10 marks]

The following schema describes the organisation of an aircraft flight information database.



- a. Identify an example of an entity, attribute and relationship within the above schema. [3]
- b. A particular Qantas Boeing 747 flight leaves Sydney and flies via Auckland to Hawaii. [4]
Describe the records required in each table to represent this flight.
- c. Construct an SQL statement to retrieve all flights commencing from Los Angeles airport [3]
(Airport code LAX) on 23 August 2012. The results are to be sorted on departure time and only the flight number and departure date/time should be displayed.

QUESTION 24**[6 marks]**

Surroundpix is an online service that creates virtual tours on behalf of real estate agents and their clients. A screen shot of a final virtual tour web page is shown below.



The process of creating a virtual tour includes:

- ▶ Taking photographs
 - › Still images are taken by a Surroundpix photographer with a high-quality DSLR camera.
 - › Each SurroundPix sequence requires 12 web-quality still images to be taken by rotating a wide-angled lens camera 30 degrees between each frame.
- ▶ Image processing
 - › All images are digitally processed to enhance their appearance.
 - › Still images are stored in two formats – one suitable for commercial printing and another version suitable for use on the web.
 - › Surroundpix files are created using proprietary software that stitches the 12 images together into a complete 360-degree continuous image.
- ▶ Website production
 - › Surroundpix files and still images (in both print and web format) are added to the database located on Surroundpix's web server, together with other text data about the property.
 - › An email is sent to the real estate agent that includes two URLs. One URL enables download of the high resolution images and the other is a direct link to the completed virtual tour.

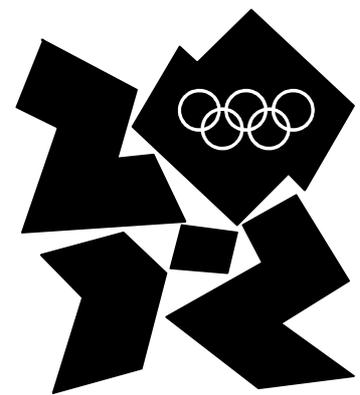
- a. Explain how advances in processing and communications technology for end users have enabled such a service to gain mainstream status. [2]
- b. Discuss social and ethical issues related to this system. [4]

QUESTION 25

[11 marks]

A company has won a contract to supply security infrastructure and personnel for the 2012 London Olympics. The company has offices in Sydney, New York and now London. Each week the senior management at all offices participate in a teleconference over the Internet that includes both audio and video.

- a. Compare and contrast the use of teleconferencing with traditional telephone and face-to-face communication in this situation. [4]
- b. Identify and briefly describe the information technology required by this teleconferencing system. [3]
- c. Recently, formal and costly teleconferencing systems have been replaced by free or inexpensive web services such as Skype, Apple Facetime, Facebook Video Calling and Google Plus Hangouts. Discuss this new trend with regard to the new possibilities and risks it presents for commercial users. [4]



QUESTION 26**[9 marks]****Banks 'killing' the bush¹****MPs blast branch closures as communities feel the pain***By Mark Thornton**16 January, 2004*

Banks that close branches in rural and remote areas leave "gaping holes" in those communities which lead to their slow deaths, according to a Federal parliamentary report. The report, by the joint committee on corporations and financial services, criticised the closure of rural branches purely on economic grounds, particularly because the action was usually taken without any community consultation. Finance Sector Union figures show banks have closed 2000 branches nationally in the past decade.

The committee recommended banks develop comprehensive community consultation procedures before closing any more branches. It said part of the problem had been the Australian Prudential Regulation Authority's inadequate database on the availability of banking services. The committee suggested another government agency take over the work.

"It concerns the committee that there are pockets in the Australian community where competition in the retail banking industry is not strong and where the withdrawal of bank branches has created a void in the provision of banking and financial services," committee chairman Senator Grant Chapman said.

"Time and again, we have heard that while technology may have ameliorated the difficulties this has created in conducting financial transactions, it has not replaced the gaping hole left in the Community by the departure of the local bank manager, who was not only a trusted financial adviser who knew the local people and local economy, but was also a local community leader."

The Federal parliamentary report included the following recommendations:

- ▶ Give a minimum of six months written notice to customers before closing a branch
- ▶ Prepare a community impact statement to help customers understand the reasons behind the closure and help them decide any action
- ▶ Arrange the free transfer of accounts to other institutions of the customers' choice
- ▶ Better education and training programs in the use of new technology so older and indigenous Australians can use Internet and telephone banking services

The Australian Consumers Association said the recommendations did not go far enough. The Australian Bankers Association said it would consider the report.



The major branches have been blasted by MPs. Photograph provided by Business Standard

¹ Reproduced by permission from The Western Australian

- a. Describe banking services that are difficult to perform, or simply cannot be performed, using Internet and telephone banking. **[3]**
- b. Closing rural bank branches clearly results in job losses for bank employees. However research shows further job loss occurs within local businesses. Outline likely reasons for these further job losses. **[3]**
- c. Briefly describe potential strategies for implementing the committee's fourth (and final) recommendation. **[3]**

SECTION C

Extended Answer: Core Topics

QUESTION 27

[8 marks]

A sales analysis package is under development for use within the hotel industry. This package uses historical data including details of each past guest stay in the hotel. External data particular to each hotel's location is also imported or entered into the database. Examples of local data include:

- ▶ Dates of major sporting and entertainment events
- ▶ Historical weather forecasts
- ▶ Relevant school holidays

The package is to be used by the management of the hotel to allow them to better predict the number of guests likely to use the hotel on a week-to-week basis. Management can then adjust staffing levels more efficiently. The sales team will use the product to predict times of low occupancy. Advertising and other marketing strategies can then target these times.

- a. Identify participants in this decision support system, and for each, provide an example of a decision where the system would be able to assist. **[3]**
- b. Is this hotel DSS best described as working in a structured, semi-structured or unstructured situation? Justify your response. **[3]**
- c. The results obtained from this system should, in theory, improve the profitability of hotels. However it is possible that results could be erroneous. Discuss the effects of negative results and who would be responsible for these negative results. **[2]**

QUESTION 28**[13 marks]**

The management of ABC Corporation wishes to generate forecasts of their corporation's performance over the next five years. The system must meet the following requirements:

- ▶ Generates accurate predictions of post-tax profit for each of the next five years
- ▶ Alters the predictions appropriately for different forecast inputs, in terms of total sales increases or decreases
- ▶ Alters the predictions as the user adjusts the cost of goods, administration and marketing relative to total sales made
- ▶ Use and display real data from at least the previous year to verify that inputs and predictions are realistic
- ▶ Details costs associated with producing goods, administration of the business and marketing for each prediction
- ▶ Express each of the above costs relative to total sales
- ▶ Detail actual sales totals required to meet predicted profits
- ▶ Forecasts will take account of two external variables: inflation and taxation rates

a. Identify plausible data sources associated with each of the following data inputs: **[3]**

- i. Past year sales records
- ii. Past year cost records
- iii. Current and future predicted inflation rates
- iv. Company tax rates
- v. Percentages increase or decrease in sales
- vi. Percentage of total sales for different cost categories

b. Develop a pen-and-paper spreadsheet design that performs the functions outlined above. **[10]**

QUESTION 29**[13 marks]**

The table below shows a partially-developed knowledge base to be included in an expert system. This system is used to determine whether a security licence should be issued to an applicant, and is used during interviews between a clerk and an applicant.

#	Rule
1	Security Licence issued IF Correct age AND Conditions met
2	Conditions met IF Good references AND Australian resident

#	Rule		
3	Australian resident	IF	Valid document sighted
4	Valid document sighted	IF	Australian birth certificate OR Australian citizenship OR Evidence of Resident Status
5	Good references	IF	2 Authorised referees AND < 12 months old
6	Authorised referees	IF	Supplied by doctor, teacher, Justice of the Peace or religious leader
7	Correct age	IF	>=18

- a. Construct an equivalent decision tree for the logic in this system. **[2]**
- b. We now wish to modify the rules above to include information relation to the completion of mandatory training. **[3]**
- ▶ Training must be offered by an organisation which is a Registered Training Organisation (RTO) approved by the Police Commissioner. Such organisations have a current RTO Master Licence number.
 - ▶ Once an applicant has attended a suitable training course, they must sit a test. Their result must be 100% in the section on Relevant Law, and greater than 50% overall in the remaining sections.

Modify any relevant rules in the knowledge base and include any new require rules to incorporate this extra information.

- c. Distinguish between the role of the human expert and the knowledge engineer in the development of this expert system. **[3]**
- d. During a particular interview, the system determines that a security licence should be issued. Describe the Processing information processes occurring as the inference engine backwards chains and reaches its conclusion, with reference to the original knowledge base. **[5]**

QUESTION 30**[14 marks]**

Women are advised to have an annual Pap smear to detect cells that may develop into cervical cancer. A cell sample is taken and this sample is placed onto a slide which is sent to a laboratory for examination. Detected early, cervical cancer has an almost 100% chance of cure.

Papnet is the name of a neural network system designed to assist in the process of analysing these slides to detect abnormal cells.

Since a patient with a serious abnormality can have fewer than a dozen abnormal cells among the 30,000-50,000 normal cells on her Pap smear, it is very difficult to detect all cases of early cancer by this 'needle-in-a-haystack' search. Imagine proof-reading 80 books a day, each containing over 300,000 words, to look for a few books each with a dozen spelling errors! Relying on manual inspection alone makes it inevitable that some abnormal Pap smears will be missed, no matter how careful the laboratory is. In fact, even the best labs can miss 10%-30% of abnormal cases.

"The traditional Pap smear has contributed to the dramatic decrease in deaths from cervical cancer. Nevertheless, its accuracy has been limited to-date because of its dependence on the microscope and human manual screening," says Dr. Gary Goldberg, professor and director of gynaecology, associate director of gynaecologic oncology, Albert Einstein College of Medicine and Montefiore Medical Centre.

"This study demonstrates that this applied computer technology, Papnet, can assist the cytopathologist in detecting a greater number of abnormal smears and, therefore, help the clinician prevent invasive cervical cancer.

Source: <http://www.pslgroup.com/dg/3ecb2.htm>

- a. Describe the sources of data for the Papnet neural network system, and the role of training in the effectiveness of this system. **[3]**
- b. Critically analyse the responsibility of those involved in decision making with Papnet. **[3]**
- c. Justify why an expert system was determined to be an unsuitable or inappropriate solution to this problem. **[2]**
- d. Critically evaluate the use of this neural network system compared to the previous manual system where trained pathologist would manually check each slide. **[6]**

QUESTION 31

[6 marks]

A shopping mall is investigating the possibility of installing a series of information kiosks. Each kiosk will include an interactive map of the shopping mall together with a list of stores grouped into categories. Touching on a store either on the map or within the list brings up detailed information about the store.

The kiosks will also include a buyer loyalty awards system. Receipts from all stores will include a barcode, and buyers who join the loyalty awards system are given a card that also includes a unique code. To accumulate points, the buyer first scans their card and then scans their store receipts. Awards points can be redeemed for vouchers that provide discounts on goods within various stores.

- a. Identify the information technology and data/information that would be involved in the implementation of these kiosks. **[3]**
- b. Describe the roles and skills of TWO different people involved in the development of the information kiosks. **[3]**

END OF EXAM