HIGHER SCHOOL CERTIFICATE EXAMINATION

1996

COMPUTING STUDIES

2/3 UNIT (COMMON)

SECTION I—CORE

(40 Marks)

Total time allowed for Sections I and II—Three hours
(Plus 5 minutes' reading time)

DIRECTIONS TO CANDIDATES

Part A (20 marks)

- Attempt ALL questions.
- Mark your answers in pencil on the Answer sheet provided.

Part B (20 marks)

- Attempt BOTH questions.
- Answer the questions in the spaces provided in this paper.
- Write your Student Number and Centre Number in the spaces provided on the first page of each question.

PART A

(20 Marks)

Attempt ALL questions.

Each question is worth 1 mark.

Select the alternative A, B, C, or D that best answers the question.

Mark your answers in pencil on the Answer Sheet provided.

1. One of the skills of a computer systems analyst is

(A) communicating with people.

(B) preparing input data for a computer.

(C) preparing a job to run on a computer.

(D) understanding the technical details of programming languages better than programmers.

2. Procedures that specify how to determine requirements and how to implement new systems are used by

(A) systems users.

(B) systems analysts.

(C) systems operators.

(D) systems programmers.

3. During the requirements definition stage of the system development cycle, most of the important information is obtained from the

(A) analyst.

(B) manager.

(C) programmer.

(D) user.

4. Determining whether a new system can be completed by the implementation deadline is part of assessing

(A) cost feasibility.

(B) schedule feasibility.

(C) technical feasibility.

(D) functional requirements.

5 . To keep track of data elements, a systems analyst could develop a

(A) data file.
(B) data dictionary.
(C) system flowchart.
(D) data flow diagram.

6 . The approach used in top-down analysis and design is to

(A) prepare flowcharts after the initial analysis has been done.
(B) prepare function diagrams after the initial analysis has been done.
(C) identify the top-level functions by combining many smaller components into a single unit.
(D) identify a top-level function, and then create a hierarchy of lower-level modules and components.

7 . During which stages of the system development cycle are programmers likely to have a substantial involvement?

(A) *Analysis, design,* and *implementation and testing.*
(B) *Analysis, design,* and *requirements definition.*
(C) *Design, operation and evaluation,* and *requirements definition.*
(D) *Implementation and testing,* and *operation and evaluation.*

8 . Specification of the hardware to be purchased for a new system should be done during which stage of the system development cycle?

(A) design
(B) feasibility
(C) requirements definition
(D) implementation and testing

9 . During which stage of the system development cycle will procedures be developed?

(A) design
(B) analysis
(C) requirements definition
(D) implementation and testing

10. Post tests are usually associated with

(A)   a loop that need not execute at all.

(B)   a loop that will be executed at least once.

(C)   the operation and evaluation stage of the system development cycle.

(D)   the implementation and testing stage of the system development cycle.

USE THIS ALGORITHM TO ANSWER QUESTIONS 11 AND 12.

```
BEGIN
get Num (an integer) from the user
set Count to 0
WHILE Count < Num
       set Temp to Count + 1
       print Temp
       increment Count
ENDWHILE
print Count
END
```

11. What is the output after the user enters a value of '3'?

(A)   1, 2, 3

(B)   0, 1, 2, 3

(C)   1, 2, 3, 3

(D)   1, 2, 3, 4

12. What is the output after the user enters a value of '–1'?

(A)   0

(B)   –1, 0

(C)   No output—the program will terminate normally.

(D)   No output—the program will terminate abnormally.

13. BEGIN
      set Counter to 1
      REPEAT
            print "Olympic Games"
      UNTIL Counter ≥ 2000
      END

When the above algorithm is run, how many times will "Olympic Games" be printed?

(A) 2000 times

(B) 2001 times

(C) less than 2000 times

(D) more than 2001 times

14. Evaluation of an algorithm's validity by tracing the effect of test data is called

(A) data bias.

(B) data integrity.

(C) desk checking.

(D) bench-marking.

15. A binary search

(A) moves through ordered data sequentially.

(B) moves through ordered data non-sequentially.

(C) moves through unordered data sequentially.

(D) moves through unordered data non-sequentially.

16. Stepwise refinement is characterised by

(A) correction of errors in program code.

(B) a gradual improvement in algorithm design.

(C) a reduction in the number of steps for the program to execute.

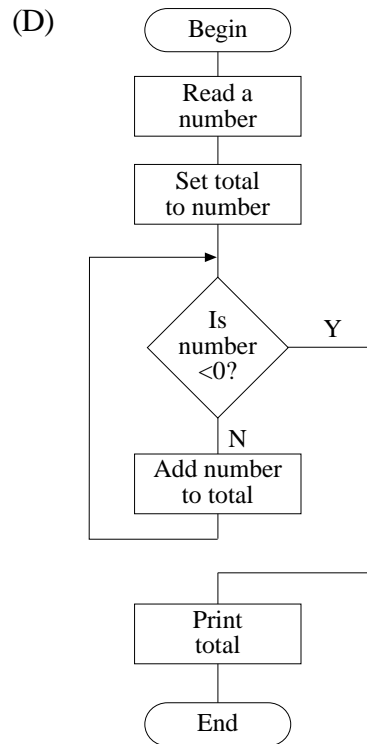(D) development of an improved set of test data to locate 'hidden' errors.

17.
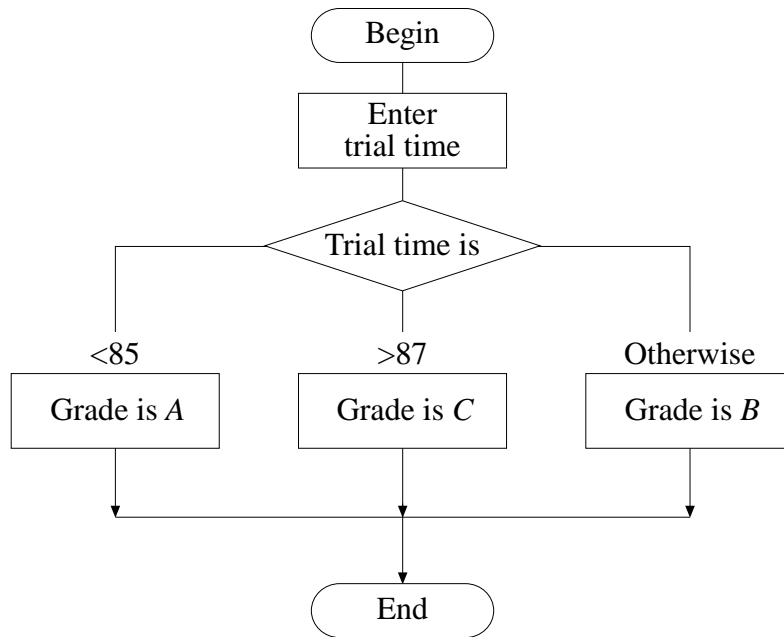
To test this algorithm, a minimum data set is

(A) 85, 87

(B) 84, 85, 87

(C) 84, 85, 87, 88

(D) 84, 85, 86, 87, 88

18. A program repeatedly accepts numbers until the user enters a negative number. It then prints the total of the numbers, including the last negative number. Which of the following algorithms correctly describes the program?

(A)

Begin

Read a number

Set total to 0

Is number <0? Y

N

Add number to total

Print total

End

(B)

Begin

Set total to 0

Read a number

Add number to total

Is number <0? Y

N

Print total

End

(C)

Begin

Read a number

Set total to number

Is number <0? Y

N

Read a number

Add number to total

Print total

End

(D)

Begin

Read a number

Set total to number

Is number <0? Y

N

Add number to total

Print total

End
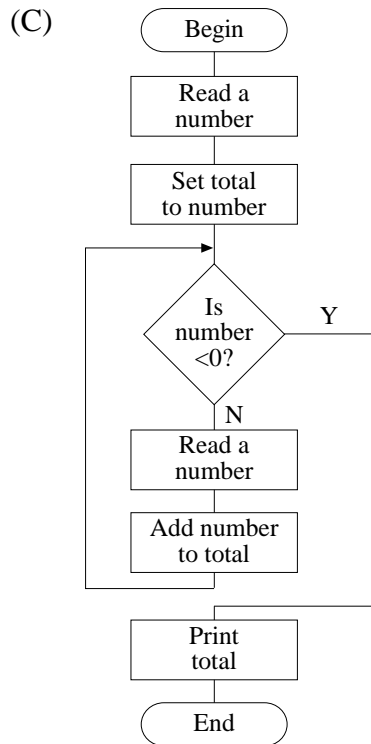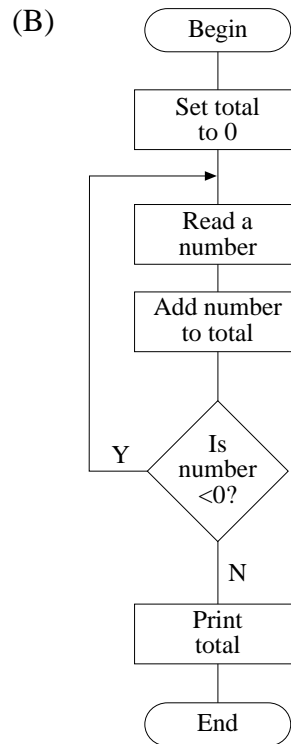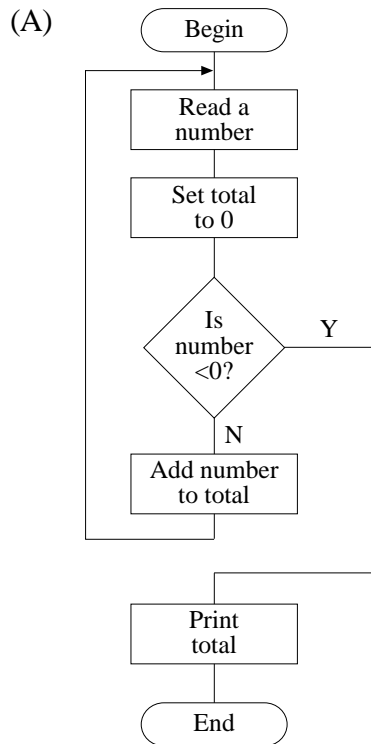
19. BEGIN
    set A to 0
    set B to 1
    REPEAT
        set A to A+B
        print A
        increment B
    UNTIL B = 4
    END

The output from running the above algorithm is

(A)   1, 3, 6

(B)   0, 1, 3, 6

(C)   1, 3, 6, 10

(D)   0, 1, 3, 6, 10

20. BEGIN
    read A
    WHILE A > 0
      set Answer to 'No'
      IF A > 8 THEN
        set Answer to 'Yes'
      ENDIF
      print Answer
      Read A
    ENDWHILE
    END

The following values are read in sequence:

8, 3, 0

The output from running the above algorithm is:

(A)   No, No

(B)   Yes, No

(C)   No, No, No

(D)   Yes, No, No

PART B

Marks

(20 Marks)

QUESTION 21.   Computer-based Systems (10 marks)

(a)   (i)   Explain the role of the systems analyst in developing a computer-based system.   **5**

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

(ii)   What is a feasibility study, and why is it important?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

(iii) Parallel conversion can be used in the implementation and testing stage.

1.   Explain the process of parallel conversion.

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

2.   State a disadvantage of using parallel conversion.

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

QUESTION 21. (Continued)   **Marks**

(b)   (i)   A computer-based system has been successfully planned, analysed,   **5**
              designed and tested. Describe TWO activities that need to be carried out
              during system implementation to ensure successful operation of the
              system.

              Activity 1 …………………………………………………………

              …………………………………………………………………

              Activity 2 …………………………………………………………

              …………………………………………………………………

       (ii)   A new computer-based claims system, developed and installed in an
              insurance company, contains a program that counts the number of
              insurance claims processed by employees each day. Management
              reviews this data each week. Discuss TWO social implications of this.

              …………………………………………………………………

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              …………………………………………………………………

              …………………………………………………………………

              …………………………………………………………………

              …………………………………………………………………

       (iii) A system can be tested using actual data, or by use of data designed
              specifically to test the system. Give ONE advantage of each method in
              discovering errors in a system.

              Actual data …………………………………………………………

              …………………………………………………………………

              Specific data ………………………………………………………

              …………………………………………………………………

1996
HIGHER SCHOOL CERTIFICATE EXAMINATION
COMPUTING STUDIES
2/3 UNIT (COMMON)—SECTION I, PART B

QUESTION 22. Algorithm Design (10 marks)

Marks

(a)   The following diagram represents an array of integers:

17	−12	3	87

2

The algorithm below was proposed as a method of finding the largest element in such an array. (The numbers in circles are present to allow lines to be identified, and are NOT part of the pseudocode.)

```
1   BEGIN
2   set Count to 1
3   set Max to –1
4   WHILE Count < number of entries in array
5      IF data at Count > Max THEN
6         set Max to data at Count
7      ENDIF
8      increment Count
9   ENDWHILE
10  print Max
11  END
```

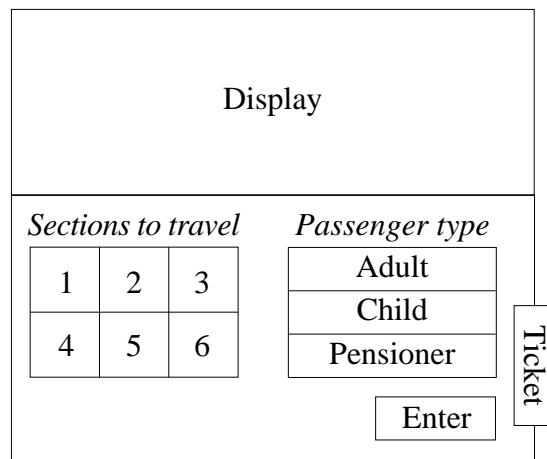The algorithm has errors in two lines. For each of the errors, identify the line in error and rewrite it correctly.

1.   …………………………………………………………………………

……………………………………………………………………………

2.   …………………………………………………………………………

……………………………………………………………………………

QUESTION 22. (Continued)   **Marks**

(b)   **5**

```
┌─────────────────────────────────────────┐
│                                         │
│              Display                     │
│                                         │
├─────────────────────────────────────────┤
│  Sections to travel    Passenger type   │
│  ┌────┬────┬────┐    ┌───────────────┐  │
│  │ 1  │ 2  │ 3  │    │     Adult     │  │
│  ├────┼────┼────┤    ├───────────────┤  │
│  │ 4  │ 5  │ 6  │    │     Child     │  │ Ticket
│  └────┴────┴────┘    ├───────────────┤  │
│                      │   Pensioner   │  │
│                      └───────────────┘  │
│                         ┌─────────┐     │
│                         │  Enter  │     │
│                         └─────────┘     │
└─────────────────────────────────────────┘
```

A bus company uses ticket dispensing machines as shown in the above diagram. The machine operates as follows:

1. The machine is set to a default of '1' section to travel and 'Adult' passenger type (and these buttons are illuminated). For other travel requirements the driver presses the appropriate button(s) which then become illuminated instead.

2. The cost of the ticket is calculated in accordance with the following conditions.

┌───┐
│ *Adult fare*   │
│   │
│ 1 section ………………$0·60   │
│ 2–3 sections………….$0·80   │
│ 4–6 sections………….$1·00   │
│   │
│ *Concessions*   │
│   │
│ Child …………………50% of adult fare   │
│ Pensioner……………25% of adult fare   │
└───┘

3. When the Enter button is pressed, the cost is shown on the display and a ticket is printed showing the number of sections to travel, passenger type, and cost.

4. In order to calculate the daily takings on the bus, the cost of each ticket produced is added to a total stored in memory.

Use *EITHER* a flowchart *OR* pseudocode to describe an algorithm that performs the processing required for steps 3 and 4. Your algorithm MUST include a subprogram that calculates the cost of the ticket.

QUESTION 22. (Continued)

USE THIS PAGE FOR YOUR ALGORITHM

QUESTION 22. (Continued)   **Marks**

(c)   (i)   Use the empty array diagrams below to show the effects of the first two   **3**
              passes of a descending order bubble-sorting algorithm.

Original array | 6 | 8 | 7 | 9 |

First pass | | | | |

Second pass | | | | |

       (ii)   Name the sorting algorithm and type of order that would change the
              original array shown above to the following after the first pass.

| 9 | 8 | 7 | 6 |

Name ……………………………………………………………………

Type of order …………………………………………………………

BOARD OF STUDIES

NEW SOUTH WALES

HIGHER SCHOOL CERTIFICATE EXAMINATION

1996

COMPUTING STUDIES

2/3 UNIT (COMMON)

SECTION II—OPTIONS

(60 Marks)

Total time allowed for Sections I and II—Three hours
(Plus 5 minutes' reading time)

DIRECTIONS TO CANDIDATES

- Attempt THREE questions.
- Answer each question in a *separate* Writing Booklet.
- You may ask for extra Writing Booklets if you need them.

BLANK PAGE

QUESTION 23. Applied Artificial Intelligence and Expert Systems   **Marks**
(20 marks)

Use a *separate* Writing Booklet.

(a)   (i)   Define the following terms.   **6**

          1.   neural networks

          2.   expert systems

          3.   fuzzy logic

    (ii)   Briefly describe the difference between:

          1.   forward chaining and backward chaining, in reference to drawing conclusions in expert systems;

          2.   intelligent robots and non-intelligent robots.

(b)   (i)   Select ONE of the following areas: **4**

- voice recognition and understanding;
- neural networks.

Name the area you have selected, and identify a problem for which this area of artificial intelligence can provide a solution. Describe how the problem is solved.

    (ii)   A manufacturing firm wishes to devise a security system for access to their research and development department. Artificial vision has been suggested as a method of entry/exit control.

Describe TWO problems that might be encountered when implementing this artificial vision system.

QUESTION 23. (Continued)   **Marks**

(c)   Bill, a keen watcher of Australian films, will watch a film only if: **1 0**

- it has Australian male actors (either the male star or two of the male co-stars must be on his list of Australian actors);

and

- it has Australian female actors (either the female star or two of the female co-stars must be on his list of Australian actors);

and

- it is Australian made (either the director or the producer is on his list of Australian film-makers).

He has prepared the following set of rules and lists which are to be entered into an expert system shell to tell him whether a film is worth watching.

Rules

①	Worth watching	IF	Australian stars AND Australian made
②	Australian stars	IF	Australian male stars AND Australian female stars
③	Australian male stars	IF	Male star is in the list of Australian actors
④	Australian male stars	IF	Male co-star is in the list of Australian actors
⑤	Australian female stars	IF	Female star is in the list of Australian actors
⑥	Australian female stars	IF	Two female co-stars are in the list of Australian actors
⑦	Australian made	IF	Director is in the list of Australian film-makers, AND producer is in the list of Australian film-makers.

Lists

Australian actors	*Australian film-makers*
Robin Stevens	John King
Peter Quigley	Helen Ingwerson
Nola O'Brien	Francis Grabham
Louise Meacham	

(i)   What is the name that describes these lists and set of rules?

(ii)   What is the name given to the process of collecting the lists and rules?

QUESTION 23. (Continued)   **Marks**

    (iii)   The expert system needs to be tested before it is used. The following is one piece of test data that correctly identifies a film as being worth watching.

Title	Gone With the Sand
Male star	Peter Quigley
Male co-stars	Bruce Lee, Errol Flynn
Female star	Nola O'Brien
Female co-stars	Elizabeth Taylor, Grace Kelly
Director	John King
Producer	Helen Ingwerson

The rules contain at least two errors.

Prepare TWO further pieces of test data, each of which will identify an error, and for *each* error:

1.   write the test data;

2.   give the number of the rule that is incorrect;

3.   rewrite the rule to correct it.

    (iv)   Write extra rules (and data if required) that would allow Bill to watch any Australian-made film with John Kelly or Ann Border (his favourite non-Australian actors) as either the star or co-star.

QUESTION 24. Computer Communications (20 marks) **Marks**

Use a *separate* Writing Booklet.

(a) (i) What is the function of a repeater? **4**

  (ii) Give ONE reason why encryption might be used for signals carried by satellite?

  (iii) Describe ONE situation where microwaves would be used as a transmission medium in preference to cable-based media.

  (iv) Explain the difference between LANs and WANs.

(b) In order to connect to a remote computer, you have been advised to set your communications software as follows: **6**

- 7-bit ASCII
- 1 start bit
- 1 stop bit
- Even parity
- 2400 baud.

  (i) Is the transmission mode synchronous or asynchronous? Justify your answer.

  (ii) The system uses even parity to detect errors.

   1. Explain how even parity detects communication errors.

   2. Give ONE major deficiency of even parity as a means of detecting communication errors.

   3. Name an alternative error-detection scheme that overcomes this problem.

  (iii) Describe the process by which the maximum rate of character transmission may be determined from communications settings such as those above.

QUESTION 24. (Continued) **Marks**

(c)   The following diagram represents the use of LANs by two departments of an **10**
organisation. Both departments are located in the same building.

Department *X*   Department *Y*
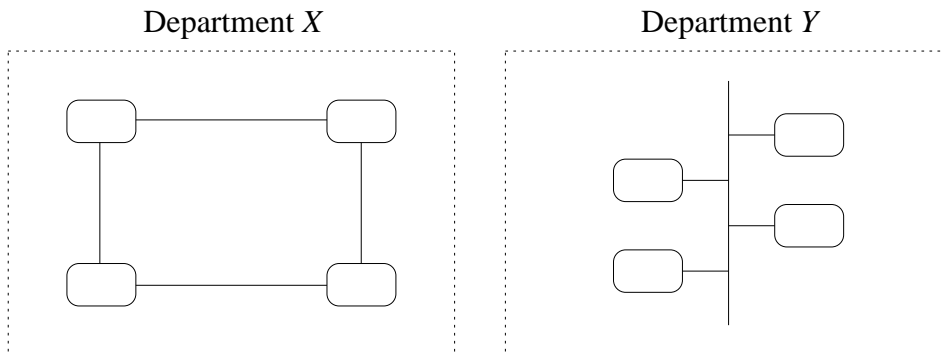
(i)   For Department *X*:

1.   Name the LAN topology used.

2.   Name a protocol that could use this topology.

3.   Give an advantage associated with the use of this LAN topology.

4.   Describe how a network protocol for this topology might handle the problem of a number of computers ready to transmit at the same time.

(ii)   For Department *Y*:

1.   Name the LAN topology used.

2.   Name a protocol that could use this topology.

3.   Give an advantage associated with the use of this LAN topology.

4.   Describe how a network protocol for this topology might handle the problem of a number of computers ready to transmit at the same time.

(iii)   Management has decided to connect the two LANs.

1.   Give THREE benefits that the organisation would expect from this connection.

2.   The two LANs use different protocols.

•   Explain the difficulties that will be encountered when connecting LANs using different protocols.

•   Name the hardware component that can be used to connect LANs using different protocols.

QUESTION 25. Computer-controlled Systems (20 marks) **Marks**

Use a *separate* Writing Booklet.

(a) *Continuous* and *Batch* are both time classifications for control systems. **4**

Choose one of these classifications, then:

  (i) name the classification;

  (ii) describe its essential features;

  (iii) give an example of a system where your choice would be appropriate, and justify your answer;

  (iv) explain why the chosen control type is different from *discrete* control.

(b) A long, single-lane bridge is controlled by a traffic light at each end. The lights **6**
allow traffic to flow in either one direction or the other direction. Every five
minutes the light at one end changes from red to green, while the light at the
other end changes from green to red.

  (i) Draw a block diagram for this system.

  (ii) Problems with the system include long waits and the potential for collisions.

    1. Identify ONE way in which a pressure sensor could be used.

    2. Identify ONE way in which a motion sensor could be used.

    3. Using *EITHER* pseudocode *OR* a flowchart, write an algorithm that would overcome the potential for collisions and long waits.

QUESTION 25. (Continued)   **Marks**

(c)   A food company manufactures a product in a heated kettle, as shown in the   **10**
      diagram below. The process is as follows.

      • A liquid ingredient is measured into the kettle, using a flow volume sensor in
        the feed line. When the specified amount has been added, the control valve is
        closed.

      • The kettle is heated until the contents reach the required temperature set point,
        at which time the heating is turned off.

      • A solid ingredient is measured in, using a weight sensor under the kettle.
        When the specified amount has been added, the control valve is closed.

      • During the addition of the solid ingredient, the temperature of the kettle
        contents may drop below the set point. If this occurs, the solid ingredient
        control valve closes and heat is turned on until the temperature rises to the set
        point again. The control valve is then opened, and the solid ingredient
        addition recommences.
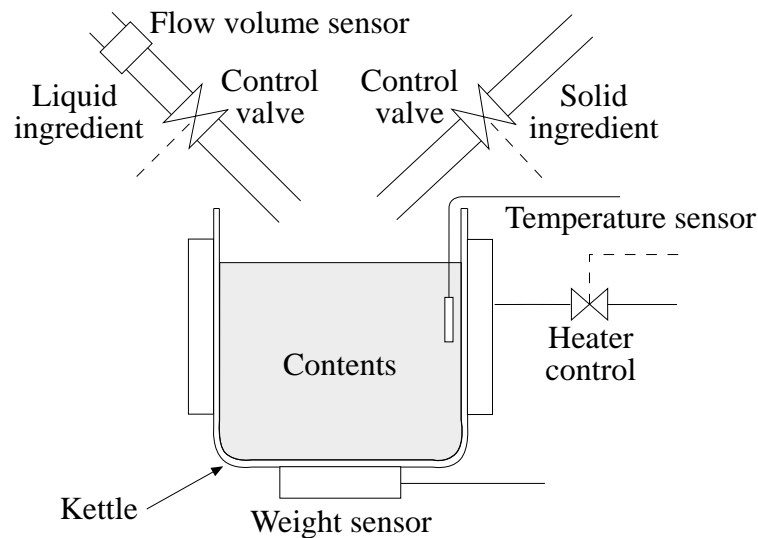
      (i)   For the liquid ingredient subsystem, select an appropriate flow volume
            sensor and an appropriate control valve, and describe how the sensor
            works in generating a signal for the computer-based controller.

      (ii) For the solid ingredient subsystem, select an appropriate weight sensor
            and an appropriate control valve, and describe how each works in
            generating a signal for the computer-based controller.

      (iii) Using *EITHER* pseudocode *OR* a flowchart, write an algorithm for the
            production sequence.

      (iv) The manufacturers have found that the amount of solid ingredient in the
            product generally exceeds the amount specified. They have tested the
            weight sensor and found it to be accurate. They have also tested the
            control valve, and found that it closes completely once it receives the
            actuating signal.

            Give ONE further possible reason why excess solid might be added, and
            suggest how the control system might be modified to minimise this
            problem.

QUESTION 26. Computing Technologies (20 marks)   **Marks**

Use a *separate* Writing Booklet.

(a)   (i)   Assuming an 8-bit system using two's complement: **6**

1.   write, in binary notation, the largest positive integer that can be stored in the system;

2.   convert your answer to decimal notation;

3.   explain the effect of adding '1' to the largest positive integer in this system;

4.   write, in decimal notation, the lowest negative number (in the sense that –2 is lower than –1) that can be stored in this system.

(ii)   Convert 27_{10} (decimal 27) to:

1.   hexadecimal;

2.   octal.

(iii) Using a 4-bit system, illustrate how two's complement may be used to subtract 3_{10} from 6_{10}.

Answer *EITHER* part (b)—Optical Technologies
      ***OR* part (c)—Theory and Construction of Integrated Circuits.**

EITHER

(b) **Optical Technologies**   **14**

(i)   Describe the main features of the laser printing process. Use a labelled diagram to support your answer.

(ii)   What advantages does a laser printer have over a dot-matrix printer?

(iii) For each of the following optical technologies:

• CD-ROM

• Magneto-optical technologies.

1.   describe the process of data storage and retrieval.

2.   how does this process differ from non-optical technologies?

(iv)   How do fibre optics and metal conductors differ in their transmission characteristics? Use the following headings:

• data capacity

• transmission velocity

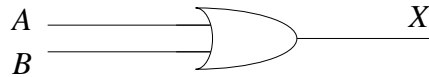• security of data

• environmental/societal considerations.

OR
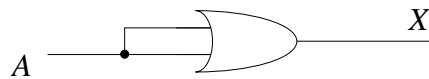
(c) **Theory and Construction of Integrated Circuits**   **14**

    (i) 1. Draw a truth table for the gate illustrated below.
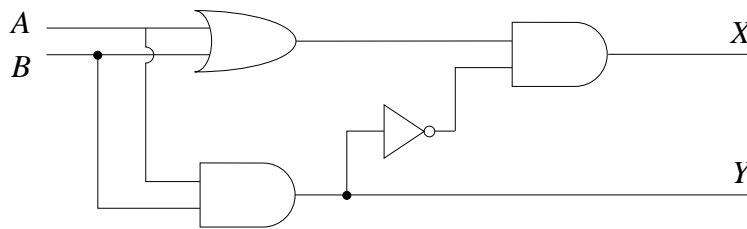

        2. Describe the effect of the following single-input circuit, which was created by joining together the two inputs to the gate.

        3. Redraw the diagram in part 2 so that it contains a modification which would always produce a '1' at *X*.

   (ii) 1. The following circuit diagram represents a half-adder.

        What is the status of the output lines *X* and *Y* if the input lines *A* and *B* are both set to 1?

        2. Describe a problem with the half-adder circuit that is solved by the use of a full-adder.

        3. Describe how a full-adder is constructed.

  (iii) Some of the main steps in the manufacture of silicon chips include design, etching, and testing. Describe each of the following two additional processes:

        1. photo masking;

        2. packaging.

  (iv) Describe the behaviour of a flip-flop with regard to storage of a single bit of information. Support your answer with *EITHER* a circuit diagram *OR* a truth table.

QUESTION 27. Database Design (20 marks)   **Marks**

Use a *separate* Writing Booklet.

(a) (i) Describe ONE way in which *data security* can be maintained for a database. **4**

(ii) Describe ONE way in which *data integrity* can be maintained for a database.

(iii) *Data redundancy* occurs when the same data is stored many times. Describe TWO problems that this can cause.

(iv) Explain the purpose of a data dictionary.

(b) An organisation needs to keep the following data about its employees in a database: **6**

- employee_id
- name
- address
- department;

and, for each week in the current year:

- pay_date
- weekly_pay
- tax_deducted.

One way to store this data would be in a single file as follows.

METHOD *A*

EMPLOYEE_ID	NAME	ADDRESS	DEPT	WEEK 1			WEEK 2			…	WEEK 52		
				Date	*Pay*	*Tax*	*Date*	*Pay*	*Tax*	…	*Date*	*Pay*	*Tax*
										…			
										…			
										…			

Another way to store the data would be to separate it into an employee file and a pay file as follows.

METHOD *B*

EMPLOYEE FILE

EMPLOYEE_ID	NAME	ADDRESS	DEPT

PAY FILE

EMPLOYEE_ID	PAY_DATE	WEEKLY_PAY	TAX

QUESTION 27. (Continued)   **Marks**

  (i)   Describe ONE advantage of storing the data in a single file, as in Method *A*.

 (ii)   Describe ONE advantage of storing the data in two separate files, as in Method *B*.

(iii) 1.   Describe the fields that would be retrieved if the following search specification were used on the two files given in Method *B*.

```
SELECT  fields employee_id, name
FROM    tables EMPLOYEE, PAY
WHERE   EMPLOYEE.employee_id = PAY.employee_id
AND     weekly_pay = 1000
AND     pay_date = 15-08-96
```

     2.   Write a search specification that could be used to retrieve the name of all employees who live in either Parramatta or Bega, and who work in either the sales department or accounts department.

     3.   A typical address is '13 Smith Street, Glenbrook, 2773'. How could the database be restructured to simplify the task of finding employees living in a particular town?

     4.   Write a search specification that could retrieve the name and address of all employees in the sales department whose tax was less than $20 on 17 October 1996, but whose weekly pay on that day was more than $500.

QUESTION 27. (Continued)   **Marks**

(c)   In a country town, the taxi owners have joined together to form a cooperative.   **10**
      The purpose of the cooperative is to

      • provide a single telephone number that people wanting taxis can ring; and

      • provide a dispatcher who answers the phone when callers ring up wanting a
        taxi, radios a message with details of each request, and allocates the job to
        one of the taxis if several want it.

      The dispatcher currently has a cardfile containing information on taxis. Details
      of callers are written onto a ruled note pad. Samples of the two types of data are
      shown below.

TAXI

Registration number	Owner's name	Taxi's age (in years)	Capacity	Other details
T12345	Sue Allan	3	5	
T23456	Tony Berry	1	5	Station wagon
T34567	Uwa Chee	2	8	Can carry 1 wheelchair

CALLER

Caller name	Pick-up address	Pick-up date	Pick-up time	Destination
Doris Marr	16 Wilson St	03.06.96	9.20 a.m.	Post office
Doris Marr	16 Wilson St	10.06.96	9.20 a.m.	Post office
Warwick Marr	16 Wilson St	03.06.96	9.20 a.m.	Railway station
Evan Luchetti	24 Smith Rd	03.06.96	10.15 a.m.	28 Airley Cres.
Stickney Kunagayagam	Railway station	10.06.96	8.30 p.m.	9 Archer Way

The cooperative wants to use a microcomputer database to record details of jobs
and taxis.

A JOB table has been established with the following attributes, for which a
partial data dictionary is shown below.

Attribute	Type	Length
Caller_name	Character	20
Pick_up_address	Character	40
Pick_up_date	Date	
Pick_up_time	Character	8
Destination_address	Character	40

QUESTION 27. (Continued)   **Marks**

(i)   In your Writing Booklet, draw a similar data dictionary for the TAXI table. The following information is needed for *each* taxi:

- registration number
- owner's name
- taxi's age
- capacity
- any special information about the taxi, such as whether it can carry a wheelchair.

(ii)   Select a primary key for each of the TAXI and JOB tables from the attributes currently in those tables.

(iii)   It would be more convenient to add another attribute, job_number, to the JOB table, and to use this as the primary key. Explain why this attribute makes a better primary key than the one you selected in your answer to part (ii).

(iv)   Explain how it would be possible to relate entries in the JOB table to the taxi which was allocated the job.

(v)   Explain one advantage of having pick_up_date stored as a field type 'date'.

(vi)   Why is there no need to specify a length in the data dictionary for the attribute pick_up_date.

(vii)   Give ONE difficulty that would be encountered if the taxi's age is an attribute in the database.

(viii)   In three or four lines, discuss the ethical concerns that might be raised by keeping the caller's name, address, and destination in the database.

QUESTION 28. Graphical Techniques (20 marks) **Marks**

Use a *separate* Writing Booklet.

(a) (i) Write down the computer-graphics term most closely described by each of the following. **6**

　　1． A section of memory used to store the data for the current image being displayed.

　　2． A smooth curve controlled by the position of a small number of individual points.

　　3． A way of describing the shape by comparing the picture width to the picture height.

　　4． The process of producing a computer image in which the image is enhanced by the addition of surface colours and textures.

　(ii) Name all the components that need to be known to calculate the memory requirement for storing an image.

　(iii) Name TWO devices that can digitise an image.

　(iv) What is 'anti-aliasing'?

　(v) What does the graphics term 'HLS' stand for?

(b) You studied the nature and role of computer graphics in the following areas: simulation, entertainment, and business graphics. **6**

　(i) Name an area you studied, and describe why the use of graphics in this area has become so popular.

　(ii) Explain how optical storage could be used in this area of study.

　(iii) Not all images used are original creations.

　　1． Describe how other image sources can be accessed and used in this area of study.

　　2． What ethical considerations are to be made when doing so?

QUESTION 28. (Continued)   **Marks**

(c)   (i)   Compression of graphics data is commonly used to save storage space.   **8**
              Describe ONE compression technique, and ONE disadvantage of using
              this technique.

        (ii)   A picture made up of millions of colours is to be downloaded from a
              digital camera to a computer with a palette of 256 colours. Describe
              TWO ways in which this palette reduction can be achieved.

       (iii)   Explain the *difference* between the operation of a raster CRT display and
              a vector CRT display.

        (iv)   Explain how animation achieves the illusion of motion.

         (v)   Paint-based programs and draw programs are designed for different
              tasks. Describe one task which is more easily performed with *EACH*
              type of program, and explain why.

        (vi)   Explain the graphical technique of 'interlacing' and describe ONE
              problem it can cause.

QUESTION 29. Multimedia (20 marks)   **Marks**

Use a *separate* Writing Booklet.

(a)   For each of parts (i)–(iv), select the alternative A, B, C, or D that best answers   **4**
the question.

(i)   In which file type is digital sound saved when stored to disk?

(A)   audio
(B)   MIDI
(C)   analog
(D)   waveform

(ii)   Which of the following is determined by the size of the VRAM?

(A)   display speed
(B)   palette colours
(C)   colour reduction
(D)   brightness of display

(iii)   CD-ROMs are used in multimedia because

(A)   the data access and transfer is extremely fast.
(B)   they are more easily updated than floppy disks.
(C)   they can permanently store large amounts of data.
(D)   there is no friction with the read heads, so image and sound are better.

(iv)   To decompress a digitised video, the computer must use

(A)   a codec.
(B)   a decodec.
(C)   a capture card.
(D)   software and a sound card.

(b)   (i)   Explain what is meant by 'hypermedia'.   **7**

(ii)   Name FOUR of the major elements that make up multimedia?

(iii)   Explain what is meant by the multimedia term 'storyboard'. Describe how a storyboard is used in creating multimedia.

(iv)   Describe how sound captured by a microphone is converted from analog to digital form.

QUESTION 29. (Continued)   **Marks**

(c)   A company has employed the services of a multimedia programmer to develop   **9**
an interactive presentation that explains all about the company, its major
interests, history, policies, future directions, etc. The presentation will be used
by new staff, investors, and in promotions.

    (i)   Name and describe THREE essential design features that should be taken
into account when creating this presentation.

    (ii)   Voice activation is one way of interacting with multimedia presentations.

        1.   Name THREE other ways of interacting with multimedia.

        2.   For this presentation, which method would you choose?

        3.   Explain why you would make that choice.

    (iii)   Give TWO reasons why an authoring package could be used to create
this presentation.

    (iv)   The developer wants to use a sound recording of a speech by the
company's chairman in the presentation. It was found to take up too
much storage. How can the item be used with less storage demands?

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