Government of **Western Australia**
School Curriculum and Standards Authority

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2014

Question/Answer Booklet

COMPUTER SCIENCE

Stage 3

Please place your student identification label in this box

Student Number: In figures | | | | | | | | |

In words _____

_____

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet
Source Booklet

Number of additional answer booklets used (if applicable): ☐

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the WACE examinations, Mathomat and/or Mathaid and/or any system flowchart template

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

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Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Short answer	23	23	70	63	40
Section Two: Extended answer	4	4	110	86	60
				Total	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2014*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in the spaces provided in this Question/Answer Booklet. A blue or black ballpoint or ink pen should be used. Wherever appropriate, fully labelled diagrams, tables and examples should be used to illustrate and support your answers.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question. Where no specific instructions are given, you should feel free to use a range of formats to express your knowledge and understandings.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

5. The Source Booklet is **not** to be handed in with your Question/Answer Booklet.

See next page

Section One: Short answer **40% (63 Marks)**

This section contains **23** questions. You must answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

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- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 1 **(1 mark)**

State **one** purpose of a computer operating system.

Question 2 **(2 marks)**

(a) State the purpose of a feasibility study. (1 mark)

(b) Name the stage in the Systems Development Life Cycle (SDLC) in which a feasibility study is carried out. (1 mark)

Question 3 **(3 marks)**

Provide an example of each of the following simple data types used in programming. The first one has been done for you.

Data type	Example
Character	A
Integer	
Real (floating point number)	
Boolean	

See next page

Question 4 **(3 marks)**

CSMA/CD and CSMA/CA are both network protocols.

(a) Describe the key difference between the two protocols. (2 marks)

(b) Which of the two protocols above is used in wireless networks? (1 mark)

Question 5 **(2 marks)**

State **two** reasons why a Standard Operating Environment (SOE) would be used in a large company.

One:

Two:

Question 6 **(4 marks)**

(a) Define the terms ‘full backup’ and ‘incremental backup’. (2 marks)

Full backup:

Incremental backup:

See next page

(b) List **two** advantages of using incremental backups. (2 marks)

One: _____

_____

Two: _____

_____

Question 7 **(1 mark)**

Name the component in the Central Processing Unit (CPU) that performs operations such as '<', '=', 'AND'.

_____

Question 8 **(2 marks)**

Define the terms 'data warehouse' and 'data mining'.

Data warehouse: _____

_____

Data mining: _____

_____

Question 9 **(3 marks)**

List **three** data gathering techniques used in the Systems Development Life Cycle (SDLC).

One: _____

Two: _____

Three: _____

See next page

Question 10 **(1 mark)**

Prototyping is a rapid application development (RAD) methodology. State **one** reason why prototyping might **not** be successful.

Question 11 **(1 mark)**

Study the pseudocode shown below.

```
Count ← 0
If Score = 55 then
        Total ← Total/Count
End If
```

What type of error would the pseudocode produce?

Question 12 **(2 marks)**

Programming languages can be either interpreted or compiled. State an advantage of each.

Interpreted advantage:

Compiled advantage:

See next page

Question 13 **(3 marks)**

State **three** advantages of modularisation when writing software programs.

One: _____

_____

_____

Two: _____

_____

_____

Three: _____

_____

_____

See next page

Question 14 **(3 marks)**

Study the pseudocode below.

```
Module GuessColour(StudentName, StudentAge, ColourChoice)

    Input (ColourNumber)

    If ColourNumber < 5 then
        ColourChoice ← 'Red'
    Else
        ColourChoice ← 'Blue'
    EndIf

    Print (StudentName,' (',StudentAge,')', ' likes the colour ', ColourChoice)

End Module
```

(a) Identify a local variable used in the pseudocode. (1 mark)

(b) What is the output parameter from the module? (1 mark)

(c) The following input is provided to the module:

StudentName: Edith
StudentAge: 8
ColourChoice: 5

What will be the output? (1 mark)

See next page

Question 15 **(1 mark)**

Records are a complex data type used in programming. Describe **one** characteristic of a record.

Question 16 **(2 marks)**

Repeaters and switches are both network hardware devices. Match the descriptions below to the correct devices.

Description	Hardware device (circle your answer)
Amplifies a signal and resends it out all ports to overcome signal attenuation.	repeater switch
Uses MAC addresses to filter and forward data packets.	repeater switch

Question 17 **(1 mark)**

What is the role of a router in computer networks?

See next page

Question 18 **(2 marks)**

Fibre optic cable can be either single mode or multi-mode. Describe **one** distinguishing characteristic of each.

Single mode

Multi-mode

Question 19 **(3 marks)**

Describe how the wireless protocol RFId (Radio Frequency Identification) could be used to protect clothing from theft in a retail store.

See next page

Question 20 **(3 marks)**

State **one** characteristic of each of the following software licence types.

Network (per seat) (1 mark)

Enterprise (1 mark)

Commercial/proprietary (1 mark)

See next page

Question 21 **(4 marks)**

State the purpose of each of the following stages in the Software Development Cycle (SDC).

(a) Analyse detailed requirements (1 mark)

(b) Document internally and externally (2 marks)

(c) Implement and test with live data (1 mark)

See next page

Question 22 **(6 marks)**

Consider the following database table:

Staff ID	Staff name	Staff address	Position	Salary	Branch ID	Branch address	Phone
0987	John Smith	1 Taylor Rd Bayswater	Manager	$60 000	B1	123 Cape St Osborne Park	9243 5678
0567	Lee Turner	66 George St Kensington	Deputy	$50 000	B3	8 Reid St South Perth	9876 5643
0688	Ann Howe	10 Ash Crt Rivervale	Manager	$60 000	B2	16 Leake St Victoria Park	9345 1234
0799	Tom Bond	55 Duke Rd Cannington	Assistant	$25 000	B1	123 Cape St Osborne Park	9243 5678
0145	Susan Lee	8 Swift St South Perth	Assistant	$25 000	B3	8 Reid St South Perth	9876 5643
0234	Sam Pike	77 Dugan St Willetton	Manager	$60 000	B3	8 Reid St South Perth	9876 5643

The following changes must occur in this database table. These changes create data anomalies.

- A new employee, Lee West, must be added to the table. He is employed as an assistant at Branch B3.
- Branch B1 has moved to 63 Main Street, Osborne Park.
- Ann Howe has resigned, so her record must be removed from the table.

Using the above information, explain each type of data anomaly.

(a) Insert anomaly (2 marks)

(b) Update anomaly (2 marks)

(c) Delete anomaly (2 marks)

See next page

Question 23 **(10 marks)**

The following database table is used by a school to record the courses students enrol in and the lecturer for the courses.

StudentID	Surname	Firstname	CourseID	Course	Lecturer
1300876	Smith	Mark	MA1	Maths	Jacobs
1300876	Smith	Mark	CH1	Chemistry	Purcell
1300876	Smith	Mark	PH1	Physics	Stone
1300972	Jones	Angela	MA1	Maths	Jacobs
1300972	Jones	Angela	DE1	Design	Baker
1300451	Chen	Li	MA2	Maths Specialist	Jacobs
1300451	Chen	Li	PH1	Physics	Stone
1300451	Chen	Li	CH1	Chemistry	Purcell

Normalise the data from the table above to 3NF.

- Create extra key fields as necessary.
- Underline primary keys and write 'FK' next to any foreign key or keys.

The student entry has been completed for you.
Student (StudentID, Surname, Firstname)

End of Section One

See next page

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See next page

Section Two: Extended answer **60% (86 Marks)**

This section has **four (4)** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

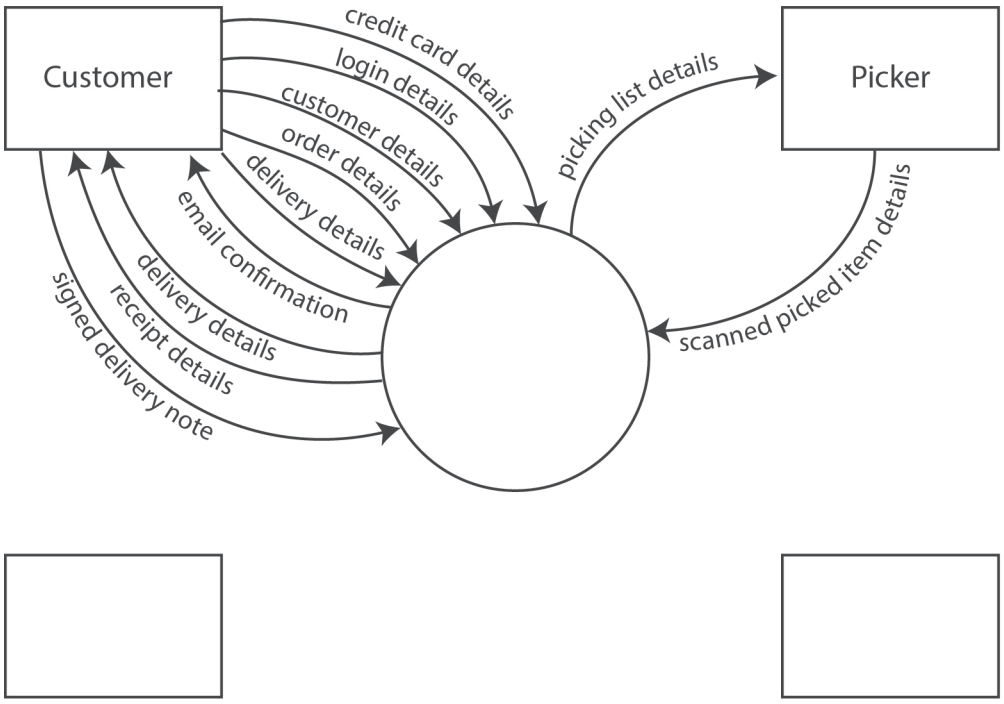
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 110 minutes.

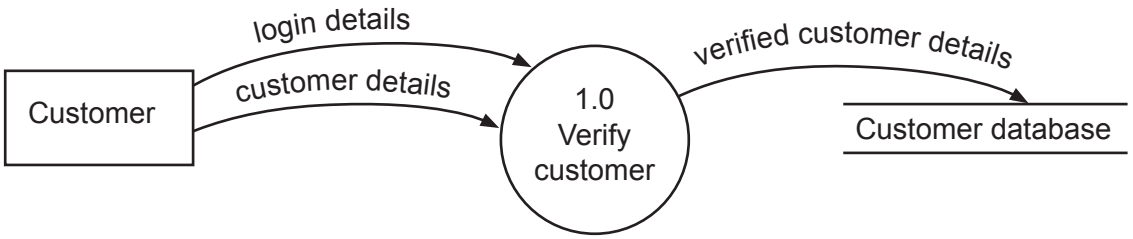
Question 24 **(24 marks)**

You will need to refer to the description on Page 2 of the **Source Booklet** to answer this question.

(a) Complete the Context Diagram for the supermarket's online ordering system. (7 marks)



(b) Complete the following Level 0 Data Flow Diagram (DFD) for the supermarket's online ordering system. (17 marks)



Question 25 **(26 marks)**

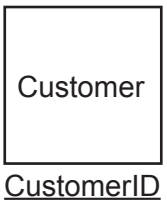
The following is a description of the relational database structure that will store data for the supermarket.

- A customer can make many orders, but each order is for one customer only.
- An order consists of many order lines.
- Each order line contains details for one product only.
- A single delivery is made for each order.

(a) Based on the information supplied above, create an Entity Relationship (ER) diagram. On your diagram include:

- relationships
- cardinality
- primary keys and foreign keys.

You do **not** need to list the non-key attributes for each entity. (15 marks)



(b) Use the sample data shown on Page 3 of the **Source Booklet** to complete the data dictionary for the Customer entity by filling in the six blank cells. (6 marks)

Element name	Data type	Size/ format	Description	Constraint
CustomerID	String			Required Automatically created when record added
Surname	String	25	Customer surname	Required
FirstName	String	25	Customer firstname	Required
Street	String	30	Customer street address	Required
Suburb	String	30	Customer suburb	Required
State	String	3	Only SA, WA, NT, TAS, ACT, NSW, VIC or QLD should be entered in this field	
Postcode	String	4	4 digit postcode	Required
HomePhone			Home phone number	Required Must include area code
Mobile	String	12	Mobile phone number if provided	

(c) Give **one** reason why the supermarket would have created a data dictionary. (1 mark)

(d) The supermarket chain will use a distributed database system. What is a distributed database system? (1 mark)

See next page

Question 25 (continued)

(e) State **one** advantage to the supermarket of using a centralised database system instead of a distributed database system. (1 mark)

(f) Define the terms ‘referential integrity’ and ‘entity integrity’. (2 marks)

Referential integrity:

Entity integrity:

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See next page

Question 26 **(20 marks)**

The supermarket needs to know which bags belong with which order. They use a unique bar-coded sticker on each bag to identify them. Before each bag is sent for delivery, it is scanned with a barcode scanner to ensure that the right bag goes to the right customer.

Each barcode contains a check digit at the end as an error checking method. The check digit is calculated using the following pseudocode.

Note: the function Mod(x, y) returns the integer remainder after x is divided by y. For example, Mod(17,5) returns the integer remainder of 2, since 17 ÷ 5 = 3 with a remainder of 2. Mod(10, 5) returns the integer remainder of 0, since 10 ÷ 5 = 2 with a remainder of 0.

```
OddSum ← 0
EvenSum ← 0
Count ← 0

Comment: special cases for Mod(x, y) where x < y
EvenSum ← EvenSum + BarCode[Count]
Count ← 1
OddSum ← OddSum + BarCode[Count]*3

Comment: main loop
For Count ← 2 to 11 do
        Odd ← Mod(Count, 2)
        If Odd = 1 then
                OddSum ← OddSum + (BarCode[Count] *3)
        Else
                EvenSum ← EvenSum + (BarCode[Count])
        End If
End For

TotalSum ← OddSum + EvenSum
Remainder ← Mod(TotalSum, 10)

If Remainder = 0 then
        CheckDigit ← 0
Else
        CheckDigit ← 10 – Remainder
End If
```

See next page

The trace table below contains a one-dimensional array. The array values have been entered into the table in the column labelled BarCode[Count].

(a) Complete the trace table to calculate the check digit for the barcode 931234554321. (5 marks)

Count	BarCode [Count]	EvenSum	OddSum	TotalSum	Remainder	CheckDigit
0	9					
1	3					
2	1					
3	2					
4	3					
5	4					
6	5					
7	5					
8	4					
9	3					
10	2					
11	1					

(b) The pseudocode on Page 22 uses a one-dimensional array. State **one** characteristic of a one-dimensional array. (1 mark)

(c) What is the purpose of the following lines of code at the beginning of the pseudocode? (1 mark)

```
OddSum ← 0
EvenSum ← 0
```

See next page

Question 26 (continued)

The supermarket has decided to offer its customers a range of delivery options. The schedule of delivery charges is based on delivery type chosen by the customer, as shown in the table below.

Delivery type	Delivery charge
Standard	$ 5.00
Fast	$10.00
Priority	$15.00

(d) What type of control structure would be most appropriate to calculate the delivery charge, given that the 'Delivery type' categories will expand in the future? (1 mark)

(e) You need to calculate and display the correct delivery charge for an order using the DeliveryType as a parameter. Write an algorithm in pseudocode for a module called CalcDelivery that will do this.

You are required to use a case statement to determine the delivery charge. (8 marks)

The supermarket must pay Goods and Services Tax (GST) on most, but not all of its items. GST is set at 10%, and is calculated by GST charge = 10% of cost price.

(f) Write an algorithm in pseudocode for a function that will calculate the correct GST charge for an item.

Assume that there is a second function available, GSTChargeable(ProductCode) that returns true if an item is subject to GST and false otherwise.

The first line has been done for you. (4 marks)

```
Function CalcItemGST(ProductCode, ItemCost, GSTPercent)
```

See next page

Question 27 **(16 marks)**

To enhance customer confidence, the supermarket requires its online ordering system to be secure.

(a) State **two** reasons why network protocols are necessary. (2 marks)

One: _____

_____

Two: _____

_____

(b) Explain how the following terms relate to the business between the supermarket and its customers.

(i) Denial of Service (DoS) (2 marks)

_____

_____

_____

(ii) Phishing (2 marks)

_____

_____

_____

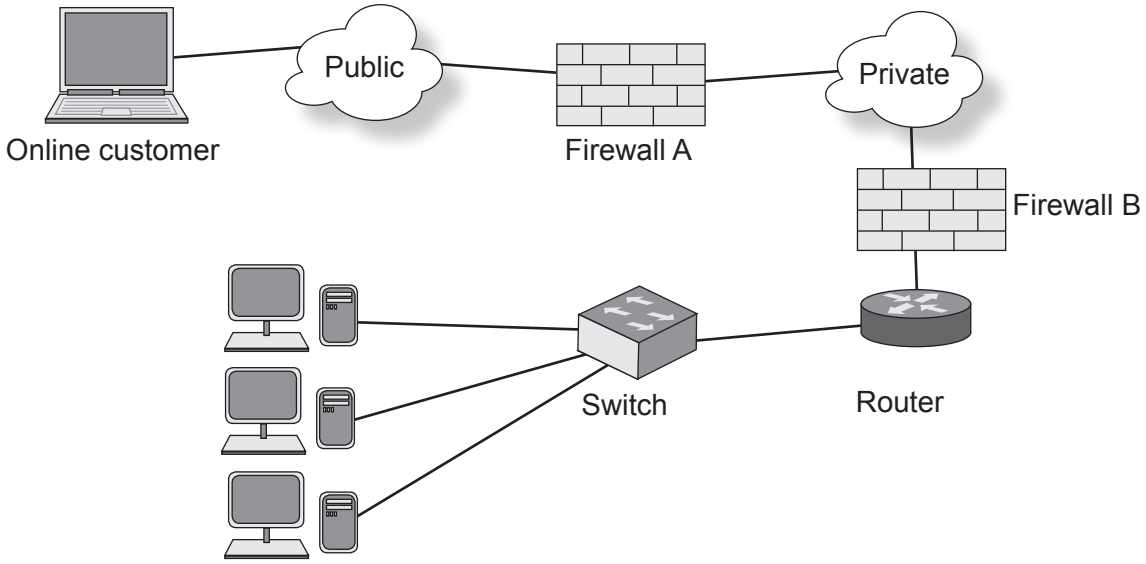
(c) Name **two** methods used for error detection and correction in digital data transmissions that could be implemented in the supermarket network. (2 marks)

One: _____

Two: _____

See next page

The diagram below shows two firewalls between the online customer and the supermarket administration network.



(d) Is Firewall A protecting the online customer or the supermarket administration network? Circle your answer.

online customer supermarket administration network

Justify your answer. (2 marks)

(e) Explain how the firewall could be effective against a DoS attack. (2 marks)

See next page

Question 27 (continued)

(f) Australian privacy laws require that an organisation must not use or disclose personal information about an individual for a purpose other than the primary purpose of collection.

Provide an example of how the supermarket could comply with this requirement. (3 marks)

(g) The supermarket is considering starting a loyalty card program whereby customer purchases are tracked for marketing and supply purposes. What must the supermarket do before it implements the program? (1 mark)

End of questions

Question number: _____

Question number: _____

Question number: _____

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