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

ATAR course examination, 2019

Question/Answer booklet

COMPUTER SCIENCE

Please place your student identification label in this box

WA student number: In figures

In words

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time: 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 this examination, 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 material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Ref: 19-015

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination
Section One Short answer	21	21	70	92	40
Section Two Extended answer	4	4	110	121	60
				Total	100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2019*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer booklet. 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 answers 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. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

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

See next page

Section One: Short answer **40% (92 Marks)**

This section contains **21** questions. You must answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 70 minutes.

Question 1 **(2 marks)**

Give **two** differences between a context diagram and a level 0 data flow diagram.

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

Question 2 **(2 marks)**

Describe **one** task that is commonly undertaken during the first phase/stage of the System Development Life Cycle (SDLC).

_____

_____

_____

_____

Question 3 **(3 marks)**

Explain how the features of the RFID (Radio Frequency Identification) communication protocol could make the technology suitable for use in identifying a family pet.

Question 4 **(4 marks)**

(a) Expand the acronym 'RAID'. (1 mark)

(b) State **three** benefits/features of using RAID. (3 marks)

One:

Two:

Three:

Question 5 **(7 marks)**

(a) Describe the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol. (2 marks)

(b) Describe the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol. (2 marks)

Consider a phone app that allows multiple users on the same call.

(c) In the context of a conversation involving multiple users, explain why the principle of Collision Avoidance is used when speaking instead of Collision Detection. (3 marks)

See next page

Question 6 **(1 mark)**

Identify **one** difference between logical and physical design.

Question 7 **(4 marks)**

Explain the purpose of benchmarking to determine system performance.

Question 8 **(2 marks)**

List **two** environmental issues relating to the disposal of computer components.

One:

Two:

Question 9 **(6 marks)**

(a) Describe **two** data-gathering techniques used in the SDLC. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

(b) Describe how the techniques in part (a) improve the overall quality of the completed system. (2 marks)

_____

_____

_____

_____

Question 10 **(9 marks)**

(a) Draw a Gantt chart to illustrate the following: (8 marks)

TASKS	START	END	DAYS
Preliminary analysis	3/4/19	6/4/19	4
Analysis	7/4/19	11/4/19	5
Logical design	12/4/19	13/4/19	2
Physical design	14/4/19	20/4/19	7
Hardware acquisition	19/4/19	20/4/19	2
Software acquisition	19/4/19	22/4/19	4
Construction	23/4/19	30/4/19	8
Testing	28/4/19	2/5/19	5

See next page

(b) Determine the length of time for the critical path (in days). (1 mark)

See next page

Question 11 **(4 marks)**

Explain **one** benefit of virtualisation, using an example.

See next page

Question 12 **(5 marks)**

A music streaming service provides many tracks by one or more artists.

(a) Draw an Entity Relationship (ER) diagram below to show the resolved relationship, including the following:

- entity names
- relationships
- cardinality. (3 marks)

In an ER diagram of a school system, one relation might be Teacher-Computer, which can be represented as a one-to-one relationship, if each teacher has their own computer.

(b) State **two** reasons why this relationship might change to many-to-many over time. (2 marks)

One: _____

_____

Two: _____

_____

Question 13 **(14 marks)**

(a) Describe **two** differences between source code and byte code. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

Consider this pseudocode function designed to compute the average of an array of numbers of finite size and return the answer in the function name. This code is used to answer parts (b), (c) and (d).

```
01 Function CalcAvg(List, Size)
02 Num ← 0
03 FOR i ← 0 TO Size - 1
04     Total ← Total + List[i]
05 END FOR
06 Result ← Total / Num
07 CalcAvg ← Result
08 End Function
```

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

_____

_____

(c) (i) Describe the role of one-dimensional arrays in programming. (2 marks)

(ii) State **one** reason why an array is a suitable data structure for the code on page 12. (1 mark)

The code on page 12 will not run correctly.

(d) (i) Identify **two** lines on which errors occur and describe briefly the error types. (4 marks)

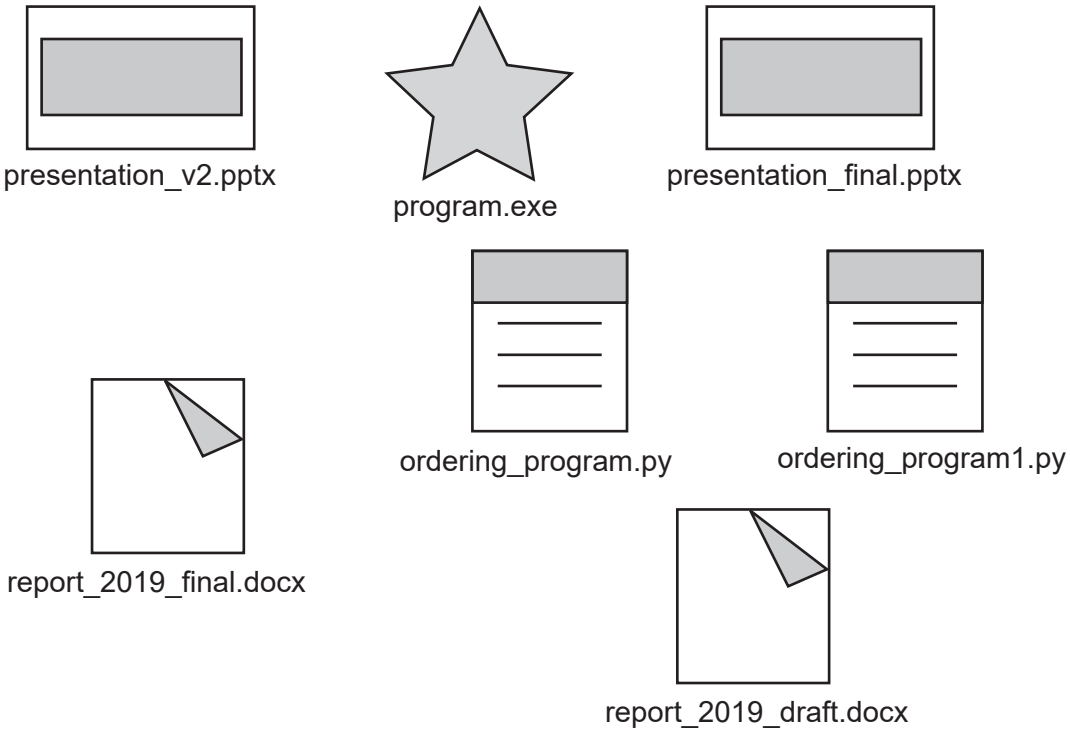
Line number with an error	Description

(ii) Write the **two** lines of code to correct the errors. (2 marks)

Line number	New code

Question 14 **(4 marks)**

A user has the following files on her desktop.



(a) Draw a diagram structuring the above files into a folder structure, using at least **two** directories. (1 mark)

See next page

(b) Justify how your structure in part (a) improves efficiency for the user as the number of files increases. (3 marks)

Question 15 **(4 marks)**

Give **two** advantages and **two** disadvantages of using cloud services to store data.

Advantages

One: _____

Two: _____

Disadvantages

One: _____

Two: _____

Question 16 **(2 marks)**

Identify **two** reasons why an online database should use its own Forward/Back buttons during record editing, instead of using browser controls.

One: _____

_____

Two: _____

_____

Question 17 **(4 marks)**

(a) State **two** benefits for an organisation in adopting a Standard Operating Environment. (2 marks)

One: _____

_____

Two: _____

_____

(b) State **two** reasons why an organisation might **not** adopt a Standard Operating Environment. (2 marks)

One: _____

_____

Two: _____

_____

Question 18 **(4 marks)**

Discuss the impact of data redundancy in a relational database and recommend a strategy to minimise its effect.

Question 19 **(4 marks)**

A juice store offers discounts to its customers.

Consider the data stored below in two tables, named Customer and Discount. Write a query using Structured Query Language (SQL) that will return the name and percentage discount rate of all customers born between the 15th and 30th of June inclusive.

Customer

FirstName	LastName	BirthDay	BirthMonth	BirthYear
Silvah	Arjab	02	June	2001
John	Kim	28	June	2002
Carrie	Hough	27	May	2001
Ling	Hudaya	22	August	2002

Discount

Month	Rate
May	20
June	10
August	12

See next page

Question 20 **(3 marks)**

Explain how encryption could be used to enhance the security of networks.

Question 21 **(4 marks)**

Describe **two** differences between a switch and a repeater.

One:

Two:

End of Section One

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See next page

Section Two: Extended answer **60% (121 Marks)**

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

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 110 minutes.

Question 22 **(39 marks)**

Refer to the Source booklet to answer Questions 22–25.

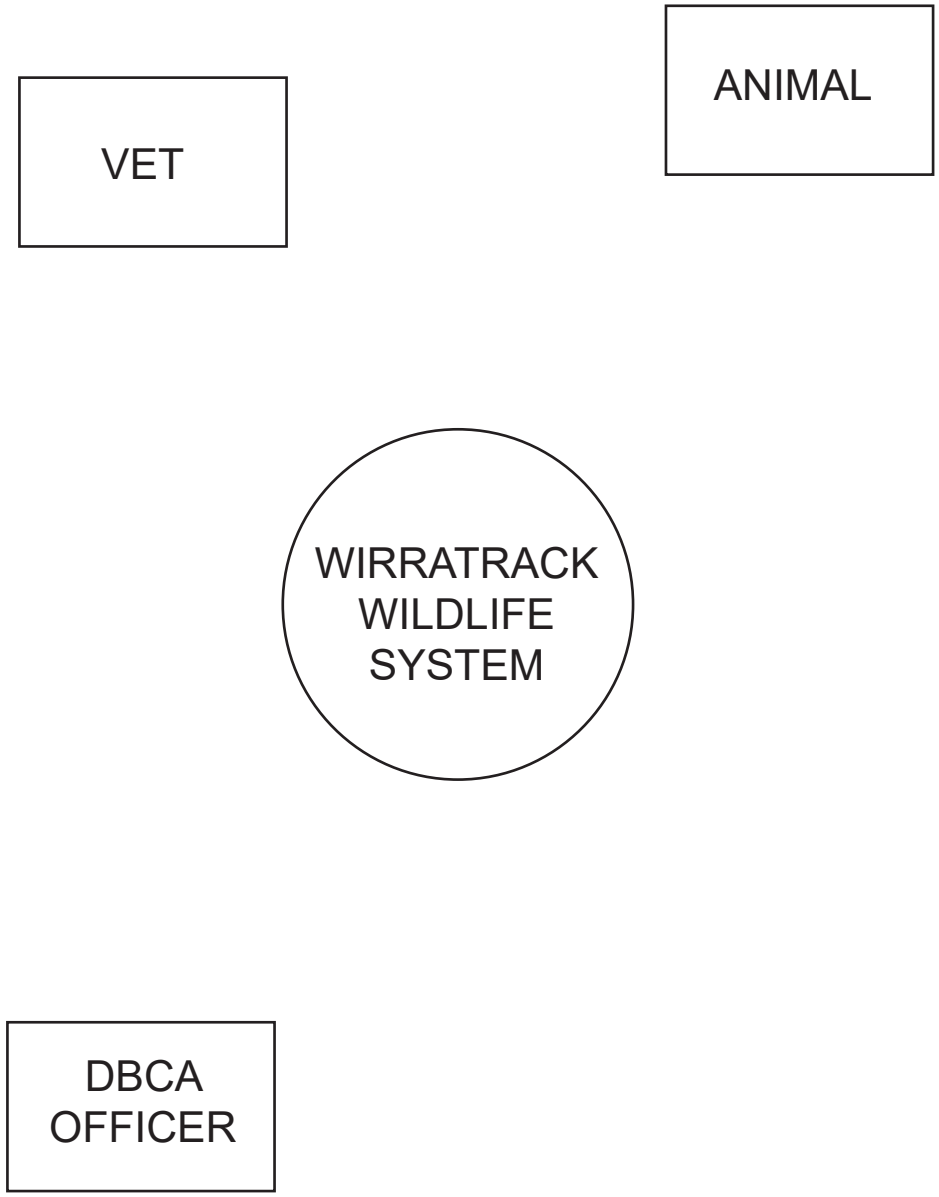
(a) Identify the system development methodology that the hospital manager of Wirratrack Wildlife Hospital (WWH) should use for the development of its new online portal system and explain your reasoning. (3 marks)

(b) Describe **two** validation rules that could be used in the WWH when a new admission record is created. (4 marks)

One:

Two:

(c) Complete the context diagram below for the WWH online portal system. (7 marks)



See next page

Question 22 (continued)

(d) Draw the Level 0 Data Flow Diagram (DFD) for the WWH online portal system. The first process has been done for you. (16 marks)

See next page

(e) With reference to your Level 0 DFD in part (d), draw a Level 1 DFD by expanding Process 1.0 Check Microchip Process. (9 marks)

See next page

Question 23 **(33 marks)**

The Wirratrack Wildlife Hospital (WWH) would like to create an online database system to track the care of the animals that require its services. The systems analyst has provided the following description of the Entity Relationship (ER) diagram for the WWH online system.

- An animal can be admitted to the hospital on more than one occasion.
- Treatment plans comprise one or more treatment items.
- One vet can treat one or more animals.
- One release officer is responsible for the release of one or more animals.

(a) Using Chen's notation, draw an ER diagram that includes the following:

- names of all primary keys
- names of all foreign keys
- relationships
- cardinality.

You need to resolve all many-to-many relationships. (18 marks)

(b) Refer to your ER solution in part (a) and write a query, using Structured Query Language (SQL) that will display the release date for each animal from 1/09/19 to 30/10/19 inclusive with the following information.

- Admission_ID
- Animal_ID
- Vet_ID
- Release_officer_ID (4 marks)

(c) Refer to your ER solution in part (a) and describe why it is necessary to normalise the data to 3rd normal form (3NF). (2 marks)

(d) Complete the data dictionary below for the Animal Entity. (5 marks)

Element name	Data type	Size/ Format	Description	Constraint
Animal_ID	AutoNumber	6	Unique identifier for each animal	
Species		30	Common name of animal	Required
Sex	String		Gender of animal	[M | F | U]
Age	Integer	3		Optional
Weight		5	Weight of animal (kg)	Required

See next page

Question 23 (continued)

(e) Draw a sample form layout below that could be used for the WWH online portal system. Your form layout should enable the entry of all required input fields for admitting an animal. (4 marks)

See next page

Question 24 **(28 marks)**

As part of its treatment plan for each animal in its care, Wirratrack Wildlife Hospital (WWH) needs to calculate the correct dosage of anaesthetic when animals are scheduled for surgery. WWH has information about the dose required for specific animals: 5 milligrams (mg) per kilogram (kg) of body weight.

(a) Given the information above, write a function in pseudocode to calculate correctly and return the dose for an animal of any weight, in kilograms. (5 marks)

(b) Call the function in part (a) from a module that prints the dose required for animals weighing in the range 1–5 kg inclusive. Assume integer values only for weight. (7 marks)

Question 24 (continued)

(c) The dose calculated in part (a) is actually an hourly rate. Write the pseudocode to calculate correctly and print the hourly dose rate for a 3 kg animal under anaesthesia for between 1–4 hours. Note that the cumulative dose cannot exceed 45 mg for this size of animal, so after 3 hours no further anaesthetic can be given. (12 marks)

See next page

(d) Verify that your code works correctly by creating a trace table for your pseudocode in part (c), listing all the relevant variables and their corresponding values for each iteration.
(4 marks)

See next page

Question 25 **(21 marks)**

For privacy reasons, at Wirratrack Wildlife Hospital (WWH) the animal data must be encrypted.

(a) Discuss the advantages and disadvantages of only encrypting the:

(i) data on the local database server (4 marks)

(ii) traffic in transit between the WWH network and an external vet. (4 marks)

WWH has an internal wired network that connects to the internet. A vet will receive an email notification from a wildlife carer that an animal is ready for release. The vet can connect from their surgery's wireless network and access the Admission record to sign-off on the release.

- WWH has desktop computers connected to its network.
- External connections from vet practices to the WWH network are allowed.
- For security reasons, the database and web servers are on different networks to the WWH desktop computers and other resources.

(b) Draw a labelled network diagram that shows a connection between an off-site vet practice and WWH. (13 marks)

End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

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