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

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.

Number of additional answer booklets used (if applicable):
Structure of this paper

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<th>Number of questions to be answered</th>
<th>Suggested working time (minutes)</th>
<th>Marks available</th>
<th>Percentage of examination</th>
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<td><strong>45</strong></td>
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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.
Section One: Short answer

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.

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**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’.  

________________________________________________________________________

________________________________________________________________________

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

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

<table>
<thead>
<tr>
<th>TASKS</th>
<th>START</th>
<th>END</th>
<th>DAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary analysis</td>
<td>3/4/19</td>
<td>6/4/19</td>
<td>4</td>
</tr>
<tr>
<td>Analysis</td>
<td>7/4/19</td>
<td>11/4/19</td>
<td>5</td>
</tr>
<tr>
<td>Logical design</td>
<td>12/4/19</td>
<td>13/4/19</td>
<td>2</td>
</tr>
<tr>
<td>Physical design</td>
<td>14/4/19</td>
<td>20/4/19</td>
<td>7</td>
</tr>
<tr>
<td>Hardware acquisition</td>
<td>19/4/19</td>
<td>20/4/19</td>
<td>2</td>
</tr>
<tr>
<td>Software acquisition</td>
<td>19/4/19</td>
<td>22/4/19</td>
<td>4</td>
</tr>
<tr>
<td>Construction</td>
<td>23/4/19</td>
<td>30/4/19</td>
<td>8</td>
</tr>
<tr>
<td>Testing</td>
<td>28/4/19</td>
<td>2/5/19</td>
<td>5</td>
</tr>
</tbody>
</table>
(b) Determine the length of time for the critical path (in days). (1 mark)
Question 11 (4 marks)

Explain one benefit of virtualisation, using an example.
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: 


See next page
Question 13

(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)

<table>
<thead>
<tr>
<th>Line number with an error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Line number</th>
<th>New code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A user has the following files on her desktop.

- presentation_v2.pptx
- program.exe
- presentation_final.pptx
- ordering_program.py
- ordering_program1.py
- report_2019_draft.docx
- report_2019_final.docx

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

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

(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: 

See next page
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.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Discount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FirstName</strong></td>
<td><strong>Month</strong></td>
</tr>
<tr>
<td>Silvah Arjab</td>
<td>May</td>
</tr>
<tr>
<td>John Kim</td>
<td>June</td>
</tr>
<tr>
<td>Carrie Hough</td>
<td>August</td>
</tr>
<tr>
<td>Ling Hudaya</td>
<td>August</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>BirthDay</strong></th>
<th><strong>BirthMonth</strong></th>
<th><strong>BirthYear</strong></th>
<th><strong>Month</strong></th>
<th><strong>Rate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>June</td>
<td>2001</td>
<td>May</td>
<td>20</td>
</tr>
<tr>
<td>28</td>
<td>June</td>
<td>2002</td>
<td>June</td>
<td>10</td>
</tr>
<tr>
<td>27</td>
<td>May</td>
<td>2001</td>
<td>August</td>
<td>12</td>
</tr>
<tr>
<td>22</td>
<td>August</td>
<td>2002</td>
<td>August</td>
<td>20</td>
</tr>
</tbody>
</table>
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
This page has been left blank intentionally
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)
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)
(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)
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.
(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)

<table>
<thead>
<tr>
<th>Element name</th>
<th>Data type</th>
<th>Size/Format</th>
<th>Description</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal_ID</td>
<td>AutoNumber</td>
<td>6</td>
<td>Unique identifier for each animal</td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td></td>
<td>30</td>
<td>Common name of animal</td>
<td>Required</td>
</tr>
<tr>
<td>Sex</td>
<td>String</td>
<td></td>
<td>Gender of animal</td>
<td>[M</td>
</tr>
<tr>
<td>Age</td>
<td>Integer</td>
<td>3</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>5</td>
<td>Weight of animal (kg)</td>
<td>Required</td>
</tr>
</tbody>
</table>
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)
Question 24  

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.  

(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.
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)
(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)
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

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