



Western Australian Certificate of Education Examination, 2009

Question/answer booklet

COMPUTER SCIENCE

Written paper Stage 3

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paper		Plea	ase pla	ice you	ır stud	ent ide	entificat	ion labe	el in this	s box
Student Number:	In figures									

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

To be provided by the candidate

Standard items: pens, pencils, eraser, correction fluid, ruler, highlighters

Special items: non-programmable calculators, 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.

Structure of this paper

Section	Number of questions available	Number of questions to be attempted	Suggested working time (minutes)	Marks available
Section One: Short Answer	25	25	70	72
Section Two: Extended Answer	6	6	110	108
			Total	180

Instructions to candidates

- 1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2009*. 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 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 answer pages are provided at the end of this booklet. If you need to use them, indicate in the original answer space where the answer is continued, i.e. give the page number.

Section One: Short Answer	72 Marks
Answer all questions in the spaces provided.	
Suggested working time for this section is 70 minutes.	
Question 1	(1 mark)
How can a stub be used in structured programming?	
Question 2	(1 mark)
How can a parameter be used in structured programming?	
Question 3	(1 mark)
How can a global variable be used in structured programming?	
Question 4	(2 marks)
Candice is writing a large, complicated program and has decided to write all the code then test the program as a whole. Provide two reasons why this is not a good idea.	first and

Questions 5 to 9 refer to the following Readings database table excerpt that contains information about a project control system.

Table: Readings

Date	Time	Temperature	Pressure	Comment
2/3/07	6am	10	100	
2/3/07	6pm	12	120	
3/3/07	6am	15	10	Valve failure
3/3/07	6pm	12	80	

Question 5	(2 marks)
The temperature field in the first record contains '10' and not contains '100' and not '100 kPa'. Explain why the temperature contain the relevant units.	
Question 6	(1 mark)
Many databases allow you to store a date and time as one field table may have been designed with these fields separate.	eld. Provide one reason why the
Question 7	(3 marks)
Database designers use validation rules to ensure data integ ensure that the pressure is not negative and not more than 5	

Question 8	(5 marks)

In relational database management systems (DBMS), the functions <i>Today()</i> or <i>Not</i> today's date. Use one of these functions to write a validation rule that could be us that the date is not more than three days before or three days after today's date.	ow() return sed to ensure
Question 9	(4 marks)
A user has asked you to develop queries to extract data from the Readings table. SQL statement to display all records that have a comment.	Write an

Questions 10 and 11 relate to the following pseudocode that calculates the n^{th} element of the arithmetic sequence 1, 1, 2, 3, 5, 8, 13. The first two elements of the sequence are set to 1, and then each element after that is determined by adding the previous two elements. Therefore, the 3^{rd} element is 1 + 1 = 2, the 4^{th} element is 1 + 2 = 3, and so on.

```
Module GetArithElement(ElementNum, Value)
  Value ← 0
  If (ElementNum = 1) or (ElementNum = 2) then
     Value ← 1
  End If
  If (ElementNum > 2) then
     NumPrev ← 1
     NumPrevPrev ← 1
     Index \leftarrow 2
     Repeat
        Current ← NumPrev + NumPrevPrev
        NumPrevPrev \leftarrow NumPrev
        NumPrev ← Current
        Index ← Index + 1
     Until Index >= ElementNum
     Value ← Current
  End If
End Module
```

Question 10 (4 marks)

	(11141110)
Create a trace table for the pseudocode for ElementNum = 5.	

STAGE 3	7	COMPUTER SCIENCE
Question 11		(6 marks)
Rewrite the pseudocode for m elements of the arithmetic seq	odule <i>GetArithElement</i> on puence.	page 6, using an array for the

STAGE 3

Question 12	(2 marks)
Explain why read instructions from the cache happen faster than read instrusecondary storage device.	uctions from a
Question 13	(4 marks)
You have been contracted to install a relational database system on a bran- system within a small office environment. The installation fails at the start of process. Describe two possible hardware causes for the failure and how you each problem.	d-new computer of the installation

Question 14	(4 marks)
Variables and a service and additional designation of a temporary	a backun ayatanı far a amall businasa

You have recommended the installation of a tape backup system for a small business. Describe two different procedures you would use to back up the hard disk. When wou	ld each
of these procedures be appropriate?	
Question 15	(2 marks)
Some relational databases allow the developer to <i>enforce referential integrity</i> for a rela between two entities. Explain why a database developer would implement referential in	tionship ntegrity.
0 4 40	(0 1)
Question 16	(2 marks)
Explain how a supermarket could use a data warehouse and data mining to improve conservice.	ustomer

Question 17 (2 marks)

The pseudocode below was written to input the rainfall for each month of a year and calculate the average rainfall for that year.

```
For x \leftarrow 1 to 10 do Input(rainfall)

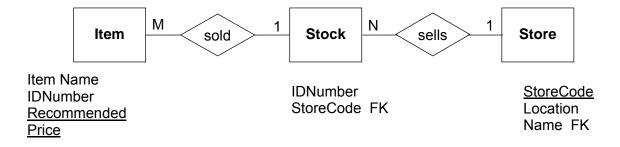
Totalrainfall \leftarrow total + rainfall End If
```

Averagerain ← total / x

Use examples from the pseudocode to illustrate **one** syntax error and **one** logic error.

Question 18 (2 marks)

The following Entity Relationship Diagram (ERD) was created to show that one item can be sold in many stores and one store can sell many items.



Analyse the ERD and identify **two** errors that exist within the diagram.

Question 19	(2 marks)
Some people think it is ethical to collect personal data about individuals from soc sites such as Facebook and MySpace. Do you agree? Justify your answer.	ial network
Question 20	(4 marks)
Compare the roles of the systems analyst and the programmer in the development implementation stages of the Systems Development Life Cycle (SDLC).	ent and

Question 21 (4 marks)

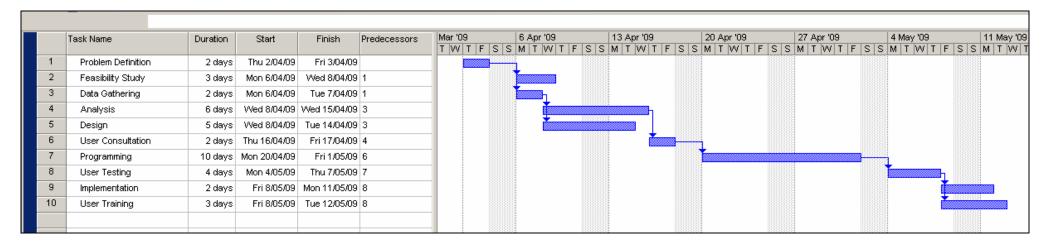
	Explain two possible effects this will have on the operating system of your computer.
	Explain two ways you could solve this problem.
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Question 23 (2 marks
In terms of the Internet, what do the initials DNS stand for? Outline the purpose of this service.
Question 24 (2 marks
What is a storage area network? Give an example of where an organisation would use this technology.

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Question 25 (7 marks)

Analyse the Gantt chart below for a small information systems project.



Draw the PERT chart that would correspond to this Gantt chart.

Section Two: Extended Answer

108 Marks

Answer all questions in the spaces provided.

Suggested working time for this section is 110 minutes.

Curry in a Flurry Restaurant

Curry in a Flurry is a restaurant that sells Indian food. The owners, Mr and Mrs Sharma, have been running the restaurant for almost 20 years. They pride themselves on their food, which is made daily from fresh ingredients.

Question 26 (16 marks)

Curry in a Flurry has a stock inventory system that stores inventory data. Mr and Mrs Sharma's daughter, Bishnu, has exported some inventory data for 2007 from the database into a sequential file with the following record structure:

StockData

Month

Item

Quantity

Cost

Some sample records are shown below.

Month	Item	Quantity	Cost
January	Rice	100	155.45
January	Black dhal	120	233.75
January	Spring onions	25	23.00
February	Rice	110	174.66
February	Diced pork	32	195.00
March	Rice	100	156.99
March	Carrots	19	33.40

Assume that the records have been sorted by month.

(a) Create the pseudocode to read the records one at a time, print them out and include a total cost for each month at the end of the records for each month. An example of the report for the sample records is shown below. (8 marks)

Curry in a Flurry Stock Inventory

Month	Item	Quantity	Cost
January	Rice	100	\$155.45
January	Black dhal	120	\$233.75
January	Spring onions	25	\$23.00
Total for January			\$412.20
February	Rice	110	\$174.66
February	Diced pork	32	\$195.00
Total for February			\$369.66
March	Rice	100	\$156.99
March	Carrots	19	\$33.40
Total for March			\$190.39

See next page

Consider the pseudocode below that calculates the cost of menu items.

```
Module Main
```

```
Input(MenuItemType)
Input(IngredientsPrice)
Case MenuItemType of
       "Entree" : SurCharge ← IngredientsPrice * 0.1
       "MainCourse" : SurCharge ← IngredientsPrice * 0.2
       "Dessert": SurCharge ← IngredientsPrice * 0.3
End Case
Case IngredientsPrice of
       < 10 : SubTotal ← IngredientsPrice + ((IngredientsPrice * 2.5) / 100)
       < 20 : SubTotal ← IngredientsPrice + ((IngredientsPrice * 4) / 100)
       < 30 : SubTotal ← IngredientsPrice + ((IngredientsPrice * 5) / 100)
       >= 30 : SubTotal ← IngredientsPrice + ((IngredientsPrice * 6) / 100)
End Case
SubTotal ← SubTotal + SurCharge
GrossPrice ← SubTotal * 1.1
Output(GrossPrice)
If GrossPrice > 50 Then
  Output ("Free poppadums with this order!")
End If
```

End Main

- (b) Bishnu has asked you to help her modularise the pseudocode before she writes the code. Analyse the pseudocode above and then rewrite it so that it has the following:
 - a module to calculate SurCharge
 - a module to calculate SubTotal
 - a module to calculate GrossPrice
 - a main module that handles input, output and calls the modules above
 - parameters to pass values as appropriate.

(8 ma	rks)

Question 27 (6 marks)

Curry in a Flurry uses a personal digital assistant (PDA) solution for the ordering of meals in the restaurant. The PDAs use an 802.11B wireless network card to connect to the access points in the building. The wireless system was installed in 1999. The business has been experiencing difficulties with orders being corrupted or unable to be sent.

	List two possible network-based reasons that would cause the difficulties desc	cribed. (2 marks
	List two security-related reasons that would cause the difficulties described.	(2 mark
cha <i>ry</i>	ntly, there have been problems at <i>Curry in a Flurry</i> , and errors have occurred wirease order system. For example, although an order for 10 kg of salt was placed, received 10 tonnes of salt. It is suspected that the web server has been comprisal hackers.	Curry in
	Describe two countermeasures that <i>Curry in a Flurry</i> could take to reduce or pathis problem.	orevent (2 mark

Question 28 (4 marks)

Curry in a Flurry has decided that they need to become more security conscious.

(a)	Explain why the owners of the restaurant should perform regular security scar business computers and network.	s on their (2 marks)
(b)	Describe two different protocols or encryption methods that may need to be implemented to reduce any problems discovered in the security scans.	(2 marks)

Question 29 (33 marks)

Many customers stop at *Curry in a Flurry* to pick up takeaway food. Mr and Mrs Sharma's son, Rhani, has suggested they should implement a Frequent Customer System (FCS) to reward regular customers. Storing information on customer purchases would enable *Curry in a Flurry* to customise the rewards offered. For example, a customer who always ordered Indian bread could be offered Indian bread for no charge when their tenth order was placed. The FCS will need to keep track of customers and the menu items ordered. Each order can be for several menu items, and each item on the menu can be ordered many times. The FCS will also need to keep track of the rewards given to each customer.

(a) Draw an Entity Relationship Diagram (ERD) to represent the data required for the Frequent Customer System in third normal form. Ensure that the ERD has all the many-to-many relationships resolved. Do not show any attributes on the diagram.

(9 marks)

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d)	Write a recommendation to Rhani outlining which Systems Development Lif (SDLC) method would be most appropriate for the development of the web-	
	system. Include a justification for your choice of method.	(4 marks)

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Question 30 (31 marks)

Curry in a Flurry uses a PDA system for the ordering of meals in the restaurant. Part of the functionality of this PDA system is that it automatically tracks and maintains ingredient levels. When a meal is ordered, the ingredients used are read from the meal table. This information is then used to update the ingredients table.

The automatic ordering of ingredients is a three-step process:

- 1. Each time a meal is ordered, quantities in the ingredients table are decreased by the amount of raw ingredients used. For example, when a medium rice is ordered, the quantity for rice in the ingredients table is decreased by 250 grams.
- 2. At the end of the day, the computer system automatically runs an application that checks the quantity field for each of the raw ingredients. If a field shows less than the required minimum amount, an order for that ingredient is created.
- 3. The orders are stored in an order table on the database so they can be checked when supplies arrive at the restaurant. The orders are printed out and sent to the suppliers.

When the orders are delivered, Bishnu checks the received ingredients against the order for accuracy.

- If the order is correct, Bishnu updates the order in the orders table as being received and complete. Details from the order are used to update the ingredients table with the amounts received.
- If an incorrect item has been supplied, Bishnu notifies the supplier and requests that they collect the incorrect item. She also confirms non-payment for the incorrectly supplied item.
- If the order is incomplete, i.e. one or more items are missing, Bishnu records the details. A backorder is created that contains details of the missing item(s), and is stored in a separate table. Backorders are checked against the original orders. Hence, when a supplier delivers an item on backorder, both the backorder file and the order file are updated to confirm that the item has now been received. The ingredients table is updated.
- Bishnu records if a supplier delivers less than the ordered quantity of ingredients. The
 order is marked as received, a backorder is created for the outstanding amount, and the
 ingredients table is updated.

(Note: You do not need to consider how *Curry in a Flurry* pays for the ingredients ordered.)

(a) Draw a context diagram for the *Curry in a Flurry* stock inventory system.

(5 marks)

(b) For the *Curry in a Flurry* stock inventory system, complete the Level 0 DFD below. (11 marks)

1.0 Order Meal

2.0 Update Ingredients

3.0 Reorder Ingredients

> 4.0 Process Received Ingredients

(c) Complete the process '4.0 Process Received Ingredients', using the incomplete Level 1 DFD below. (10 marks)

Process Correct Order

Process Incomplete Order

> Process Incorrect Order

- (d) A web developer has created a web page for *Curry in a Flurry* that allows customers to order food online. A number of their regular customers were asked to trial the web page. The feedback received from these customers included the following concerns:
 - when they used a certain browser, the web page crashed their computer system
 - another browser gave an error message when entering a quantity on the web page

Mr and Mrs Sharma have reported the customer concerns to the web developer.

• the web page was unreadable and confusing.

Explain five measures the web developer can take to ensure that all customer to use the web page to successfully order food online.	s are able (5 marks

Question 31 (18 marks)

Curry in a Flurry is expanding its operations. The owners plan to open another two stores and a new warehouse for the storage of stock. An information technology consultant has recommended the use of wireless links to form a WAN between the new stores and the warehouse. However, their ISP has recommended a fixed fibre link connection instead.

Why the ISP fibre linked connection preferable to the wireless solution?			

Each new store has a firewall, router and store-based switch that connect the access points. The access points connect to the PDAs. The new warehouse has a firewall, switch and router that connect to the database server and mail server.

(b) Draw a network diagram for *Curry in a Flurry*, that includes one store and the new warehouse. Ensure that your diagram is supported by a legend and includes WAN and LAN elements. (15 marks)

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