



Western Australian Certificate of Education Examination, 2012

Question/Answer Booklet

COMPUTER SCIENCE Stage 3

Please place your student identification label in this box

Student Number: In figures

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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 tape/fluid, 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.

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	27	27	70	70	40
Section Two: Extended answer	8	8	110	110	60
Total					100

Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2012*. Sitting this examination implies that you agree to abide by these rules.
- 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.
- 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.
- 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(s) that you are continuing to answer at the top of the page.
- The **Source Booklet** is **not** handed in with your Question/Answer Booklet.

Section One: Short answer**40% (70 Marks)**

This section contains **27** 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(s) that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 1**(2 marks)**

Describe the difference between distributed and centralised databases.

Question 2**(2 marks)**

Describe **two** ethical implications relating to data mining.

Question 3

(4 marks)

Outline the function of each of the **four** steps in the fetch-execute cycle.

Question 4

(2 marks)

(a) What is the purpose of a data dictionary?

(1 mark)

(b) Define data integrity in relation to a database.

(1 mark)

Question 5

(2 marks)

David has been hired as a computer specialist by ABC Ltd. He has discovered that the company does not have a Standard Operating Environment (SOE). State the purpose of an SOE and describe **one** feature.

Question 6

(2 marks)

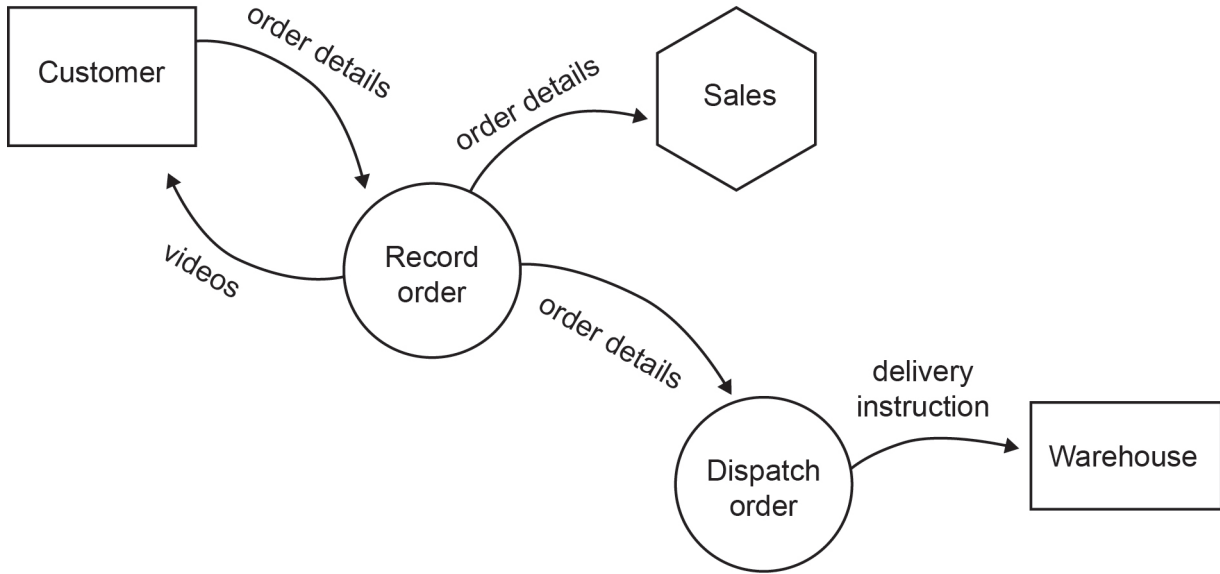
(a) What is the role of byte code in the implementation of a programming language? (1 mark)

(b) What is the principal advantage of compiling to byte code rather than machine code?
(1 mark)

Question 7

(4 marks)

Consider the Level 0 Data Flow Diagram (DFD) below, modelling an online ordering system.



(a) Name a process in this diagram. (1 mark)

(b) Name an entity in this diagram. (1 mark)

(c) An analyst has looked at this DFD and believes that it has **not** been drawn correctly. Identify **two** errors in the diagram. (2 marks)

Question 8

(6 marks)

Analyse the Gantt chart below, designed for a small systems design project. Draw the Program Evaluation Review Technique (PERT) chart that would correspond to this Gantt chart.

Number	Task	Start	End	Duration	6 / 8	13 / 8	20 / 8	27 / 8	3 / 9	10 / 9	17 / 9	24 / 9
1	Project Initiated	7 / 8 / 2012	9 / 8 / 2012	1	█							
2	Research / Brainstorming	10 / 8 / 2012	16 / 8 / 2012	5	█	█						
3	Initial Designs	10 / 8 / 2012	21 / 8 / 2012	10	█	█	█					
4	User Surveys / QA	17 / 8 / 2012	23 / 8 / 2012	5	█	█	█	█				
5	Analysis	22 / 8 / 2012	31 / 8 / 2012	8	█	█	█	█	█			
6	First Design Release to Dept	1 / 9 / 2012	7 / 9 / 2012	5	█	█	█	█	█			
7	Final Designs	8 / 9 / 2012	13 / 9 / 2012	4	█	█	█	█	█	█		
8	Final Design Release to Dept	14 / 9 / 2012	20 / 9 / 2012	5	█	█	█	█	█	█	█	
9	Implementation	21 / 9 / 2012	26 / 9 / 2012	4	█	█	█	█	█	█	█	█
10	User Training	21 / 9 / 2012	25 / 9 / 2012	3	█	█	█	█	█	█	█	█

(Draw the PERT chart in this space)

Question 9

(5 marks)

Consider the following table extracts.

Contact (ContactID, SupplierID, Title, FirstName, LastName, Department, DeptTitle, WorkPhone)

ContactID	SupplierID	Title	FirstName	LastName	Department	DeptTitle	WorkPhone
1	gmag	Mr	Harrison	Taylor	Sales	Sales Manager	(08) 9955 5478
2	mag1	Miss	Mary	Blackson	Sales	Junior Sales Rep	(08) 9420 7890
3	mag1	Mr	Grant	Gilberts	Sales	Sales Director	(08) 9420 7892
4	napp	Mrs	Gayle	Frampton	Sales	Sales Manager	(08) 9318 4442
5	napp	Miss	Lisa	Davidson	Accounts	Accountant	(08) 9318 4445
6	pb1	Miss	Greta	Pigeon	Marketing	Manager	(08) 9360 5699
7	pb1	Mr	Harry	Spalding	Accounts	Manager	(08) 9378 1234
8	ppbk1	Miss	Shona	Jackson	Sales	Junior Rep	(08) 9246 7991

Supplier (SupplierID, SupplierName, SupplierAddress, SupplierSuburb, State, Postcode, City, Phone)

SupplierID	SupplierName	SupplierAddress	SupplierSuburb	State	PostalCode	City	Phone
gmag	Global Magazines	116 Mount Street	North Perth	WA	6080	Perth	(08) 9955 5478
mag1	Magazine Extreme	18 Argyle Street	Victoria Park	WA	6100	Perth	(08) 9460 7890
napp	News Distributors	100 Elizabeth Street	North Perth	WA	6010	Perth	(08) 9318 4445
pb1	Presentation Books	10 Tewkesbury Avenue	South Perth	WA	6151	Perth	(08) 9360 5699
ppbk1	Paper Books	10 Albany Street	Bayswater	WA	6053	Perth	(08) 9646 7991

Using Simple Query Language (SQL), write a query to list all of the first and last names of the Contacts that belong to the Suppliers that reside in North Perth.

Question 10**(2 marks)**

(a) State **one** advantage for an organisation of cloud computing.

(1 mark)

(b) State **one** advantage for an organisation of server virtualisation.

(1 mark)

Question 11**(2 marks)**

An Information Technology (IT) specialist is hired by an organisation to support its infrastructure. He soon discovers that the organisation does not perform regular full backups. The last full backup was performed two weeks ago, although incremental backups have occurred every day since then. Describe the steps that the organisation or IT specialist would need to take to recover the full system if necessary.

Question 12**(1 mark)**

A local theatre company has set up a website to promote its business. At present, the website has information about upcoming productions. In two months, the company will be able to allow patrons to join as members through the website. In six months, it plans to sell tickets and merchandise on the website.

Identify the type of implementation strategy that the theatre company is using.

Question 13

(3 marks)

List **three** Boolean operators used in software development.

Question 14

(1 mark)

State **one** advantage of using Redundant Array of Independent Devices (RAID) in an organisation.

Question 15

(2 marks)

You are writing a program that processes complex tax calculations for accountants. State **two** reasons why the TAX_RATE should appear in the code as a global variable.

Question 16

(2 marks)

State **two** reasons why FOR loops are often used in the processing of one dimensional arrays.

Question 17

(6 marks)

Consider the following pseudocode.

```
Function Wondrous(n)
  z ← 0
  While n > 1 and z < 1000
    If n is even then
      n ← n / 2
    Else
      n ← 3 * n + 1
    EndIf
    z ← z + 1
  EndWhile
  Wondrous ← z
End Function
```

- (a) Explain how the While – EndWhile section of this code operates. (3 marks)

- (b) What is the purpose of the variable z in this function? (1 mark)

- (c) What will Wondrous return if the value of n is a negative number? (1 mark)

- (d) What will the loop do if the variable n never reaches the value 1? (1 mark)

Question 18**(4 marks)**

(a) State how a compiler works.

(1 mark)

(b) State how an interpreter works.

(1 mark)

(c) Identify **one** feature that is specific to a compiler.

(1 mark)

(d) Identify **one** feature that is specific to an interpreter.

(1 mark)

Question 19**(1 mark)**

A programmer for an accounts department has recently been advised not to fully implement the required security features as the department has run out of the time and money needed to finish the job properly. Identify an ethical issue with this decision.

Question 20**(1 mark)**

What is the role of a repeater in network communications?

Question 21

(2 marks)

Describe the difference between syntax and run-time errors.

Question 22

(1 mark)

State **one** reason why an organisation would use a Storage Area Network (SAN).

Question 23

(1 mark)

What is meant by the term 'phishing'?

Question 24

(5 marks)

(a) Name and describe briefly the function of **two** of the layers of the TCP/IP model.

(4 marks)

(b) In what layer would you find the File Transfer Protocol (FTP)?

(1 mark)

Question 25

(2 marks)

A programmer was advised to create a prototype of an online ordering system before extensive coding began. State **two** reasons why this advice was given.

Question 26

(2 marks)

An organisation has asked its software developer for both internal and external documentation for a new purchasing system. Describe the differences between these two types of documentation.

Question 27**(3 marks)**

Consider the following:

An owner can have more than one pet which is seen by one vet. The vet also sees a lot of pets.
Draw an Entity Relationship (ER) diagram below to match this description.

End of Section One

See next page

Section Two: Extended answer

60% (110 Marks)

This section has **eight (8)** 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.

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Suggested working time: 110 minutes.

Question 28

(8 marks)

A small theatre group is staffed mostly by volunteers. Limited funds are provided through community fundraising and grants from a range of agencies. There have been several problems with the manual ticketing system, including double bookings due to the office assistant forgetting to colour in the seats sold and misrecording of credit card details, resulting in non-payments for tickets.

It has been recommended that the manual ticketing system be changed to a computerised one as quickly as possible to alleviate these problems.

- (a) Which systems development methodology would be most appropriate for the development of the new system for the theatre group? Provide **one** reason to justify your choice. (2 marks)

- (b) Describe **one** data gathering technique that would be suitable for use with this system development methodology. (2 marks)

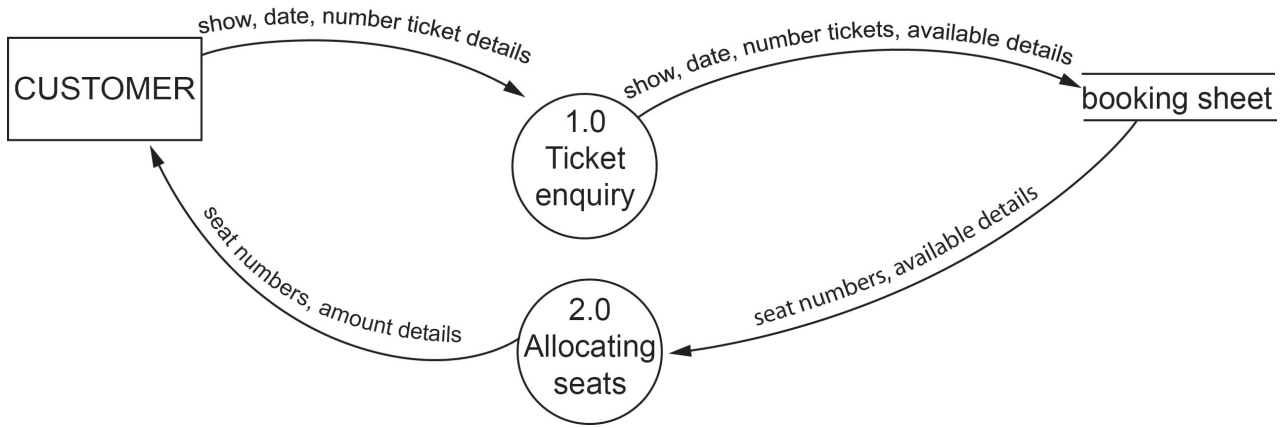
- (c) Describe **two** types of documentation that could be produced for the users of the new system. (2 marks)

- (d) Describe **two** types of supporting system documentation that would need to be produced.
(2 marks)

Question 29

(11 marks)

You will need to refer to page 2 of the **Source Booklet** to answer this question. Complete the unfinished Level 0 Data Flow Diagram (DFD) for the system.



See next page

Question 30**(35 marks)**

You will need to refer to the table on page 3 of the **Source Booklet** to answer this question.

The office assistant has tried to organise the data in such a way that it can be stored in a relational database. In terms of the table layout, explain clearly the following terms using data from the table.

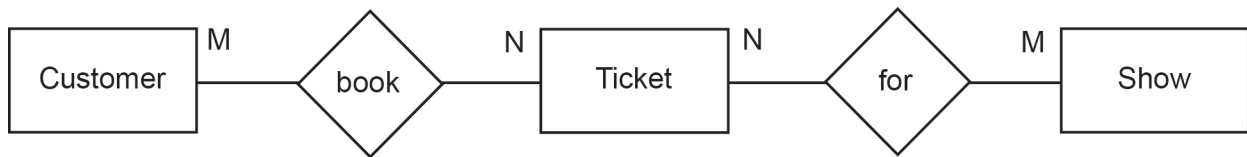
- (a) Update anomaly (2 marks)

- (b) Insert anomaly (2 marks)

- (c) Use an example from the table to explain why this data is not normalised to Third Normal Form (3NF). (2 marks)

Refer to the diagram below to answer Question 30(d) and Question 30(e).

The office assistant realises that the manual system is inefficient and has decided to use an electronic database. An Entity Relationship (ER) diagram has been drawn to indicate a possible database design.



- (d) Why is this design unsuitable for a relational database? (1 mark)

- (e) Redraw the ER diagram below so that it can be used to create a workable relational database. Include all entity names, relationships and cardinality in your diagram. (Do **not** include attributes.)

(6 marks)

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See next page

The office assistant has looked at your solution and has decided that it is unsuitable. The following database tables will be used instead:

Production (ProductionID, ShowName)

Performance (ProductionID, SeatID, Date, Time)

Seat (SeatID, Block)

Booking (BookingNumber, SeatID, PaymentType, PaymentDate, CustomerID)

Customer (CustomerID, Surname, Firstname, StreetAddress, Suburb, Postcode, ContactNumber)

(f) Use the information shown above to draw an ER diagram of the proposed database. Draw your ER diagram on page 23.

- Show entities and primary keys for the tables above.
- Show cardinality of all relationships.
- Identify foreign keys with FK.
- Include all attributes listed above.

(15 marks)

This area will **not** be marked and may be used for drafts.

Draw your ER diagram on this page.

A large, empty rectangular box with a thin black border, occupying most of the page. It is intended for the student to draw an Entity-Relationship (ER) diagram.

See next page

- (g) The importance of protecting personal, private and confidential information has been brought to the attention of the office assistant.

Make **two** suggestions that could be implemented to protect the privacy of the information stored on the theatre company's database. (2 marks)

Use the data dictionary for the Booking table shown below to answer the following questions.

Element Name	Data Type	Size/Format	Default	Description	Constraint
BookingNumber	Number			Unique identifier for each booking.	Required. Automatically created when record added.
SeatID	Number			ID of each seat in theatre.	Required.
PaymentType	String	20	Visa	Only Visa, Mastercard, American Express or cash should be entered in this field.	Required. Limited values allowed.
PaymentDate	Date/Time	Short Date	Current date	Date payment was made (e.g. 10/03/2012).	Required.
CustomerID	Number			ID of Customer.	Required.

(h) PaymentType and PaymentDate both have a default. What is the purpose of the default? (1 mark)

(i) Describe why the CustomerID is a required field. (2 marks)

(j) Why should a size be specified for most fields? (1 mark)

(k) What is the purpose of the Description field? (1 mark)

Question 31

(8 marks)

You will need to refer to page 3 of the **Source Booklet** to answer this question.

The theatre group will need to purchase a suitable computer system to run their new ticket booking system.

It has been suggested that they install a network consisting of two workstations, a printer and a file server where the booking database will be stored. The two workstations will have access to the internet. Provision needs to be made for the expansion of the network for the future.

As the theatre group has a small office, the equipment will be connected using Unshielded Twisted Pair (UTP) cable. The proposed network diagram is shown in the **Source Booklet**.

- (a) Provide **two** advantages of storing the database on the server. (2 marks)

- (b) Describe **two** problems that might be associated with using UTP cable within the network. (2 marks)

- (c) Name and describe the function of the networking devices labelled 'X' and 'Y'. (4 marks)

X: _____

Y: _____

Question 32

(23 marks)

You will need to refer to page 4 of the **Source Booklet** for an algorithm that has been created to calculate the cost of tickets purchased for a show.

- (a) Module CalcDiscount is a stub. Explain the difference between a module and a stub. (2 marks)

- (b) There are three functions and two modules in the algorithm. Explain the difference between a function and a module. (2 marks)

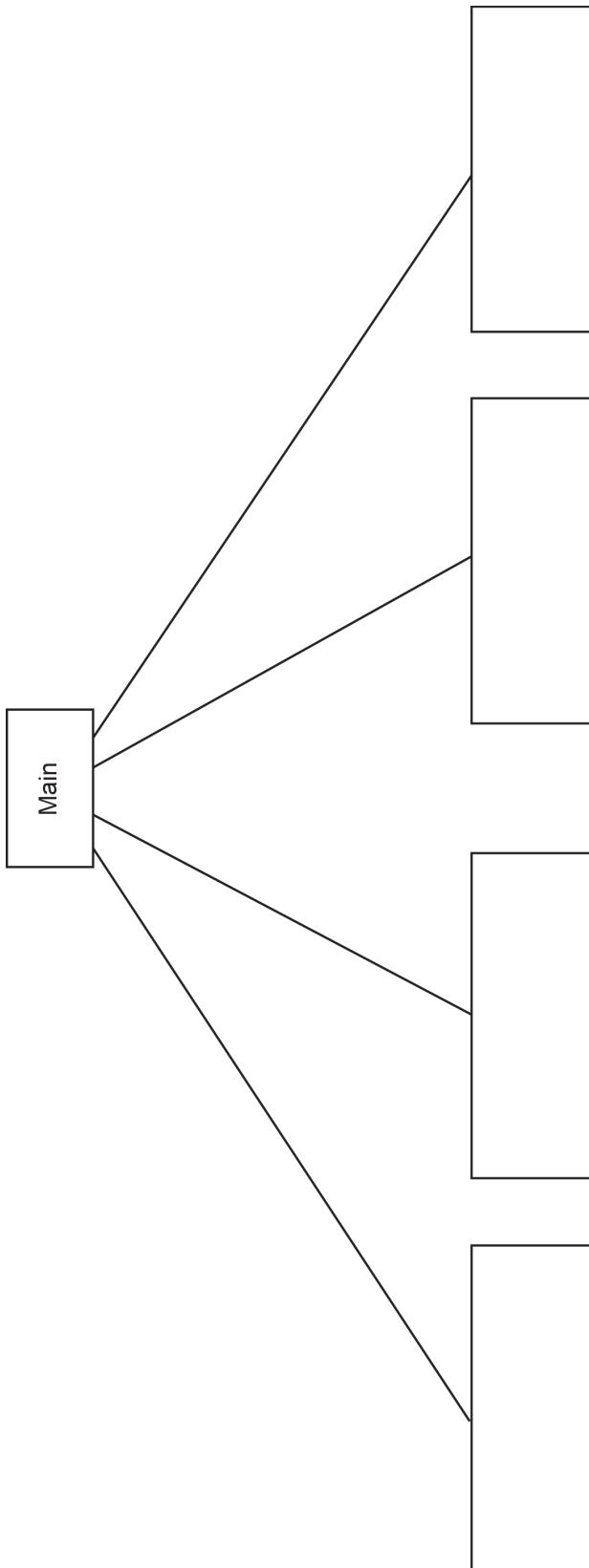
- (c) Give **one** example of each of the following from the algorithm. (2 marks)

Function Call: _____

Parameter: _____

- (d) State **one** advantage of using constants such as TicketPrice in an algorithm. (1 mark)

- (f) Complete the structure chart below showing the communication between the modules and functions on page 4 of the **Source Booklet**. (10 marks)



Question 33

(11 marks)

The theatre group would like to expand their system to calculate the total takings for each week and the average daily takings. Consider the following pseudocode.

```

Module CalculateTakings
    TotalTakings ← 0
    For Day ← 1 to 7
        Input (DailyTakings[Day])
        TotalTakings ← TotalTakings + DailyTakings
    EndFor

    AverageDailyTakings ← TotalTakings / 7

    Print ("Average takings per day is ", AverageDailyTakings)
EndModule
    
```

- (a) Why has an array been chosen for this module? (1 mark)

- (b) Complete the trace table below for Module CalculateTakings using the following values. (9 marks)

Day	DailyTakings
Monday	\$ 955
Tuesday	\$ 1200
Wednesday	\$ 700
Thursday	\$ 650
Friday	\$ 1500
Saturday	\$ 2100
Sunday	\$ 800

Day	DailyTakings	TotalTakings	AverageDailyTakings	Print

- (c) Explain **one** advantage for the theatre company of testing the application for a limited time before full implementation. (1 mark)

Question 34

(11 marks)

There are a number of factors that could affect the development of the theatre’s software applications.

- (a) Describe **two** features that the developer could implement to make it easier for a user to navigate through an application. (2 marks)

- (b) State **two** ways that the developer could establish user requirements. (2 marks)

- (c) Describe **two** factors that could increase development time of an application. (2 marks)

- (d) Outline the difference between a commercial application and a proprietary application. (2 marks)

- (e) Give **one** advantage and **one** disadvantage of using a commercial application. (2 marks)

- (f) Many developers use the Software Development Cycle (SDC) to help them plan a software solution. Describe **one** advantage this gives developers. (1 mark)

Question 35 (3 marks)

There are a number of factors that could influence the performance and security of the theatre's network.

- (a) Describe how data collisions reduce performance. (2 marks)

- (b) What is meant by the term 'denial of service'? (1 mark)

ACKNOWLEDGEMENTS

Section One

Question 7 Data Flow Diagram of an online ordering system by courtesy of the examining panel.

Question 8 Gantt chart by courtesy of the examining panel.

Question 9 Contact and supplier table extracts by courtesy of the examining panel.

Section Two

Question 29 Data Flow Diagram of bookings system by courtesy of the examining panel.

Questions 30(d) and 30(e)
ER diagram of the booking system by courtesy of the examining panel.

Questions 30(h)–30(k)
Data dictionary for the booking table by courtesy of the examining panel.

Question 32(f) Structure chart by courtesy of the examining panel.

Question 33(b) Incomplete trace table for Module CalculateTakings by courtesy of the examining panel.

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