



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



## ATAR course examination, 2023

### Question/Answer booklet

# COMPUTER SCIENCE

Place one of your candidate identification labels in this box.  
Ensure the label is straight and within the lines of this box.

WA student number: In figures

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In words

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### Time allowed for this paper

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

Number of additional  
answer booklets used  
(if applicable):

### 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: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course 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.

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Ref: 23-017



CSC

## 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	20	20	70	97	40
Section Two Extended answer	4	4	110	148	60
<b>Total</b>					100

## Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2023: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens. 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****40% (97 Marks)**

This section contains **20** 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)**

Outline **two** legal obligations developers need to consider when creating new software.

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

**Question 2****(2 marks)**

Describe **one** difference between 'source code' and 'executable code'.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**Question 3**

**(3 marks)**

Explain the role of the control unit (CU), arithmetic logic unit (ALU), registers and program counter in performing the following  $A = B + C$ .

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**Question 4**

**(5 marks)**

(a) Explain a purpose of a standard operating environment (SOE).

**(3 marks)**

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(b) Describe **one** advantage of a standard operating environment (SOE) to an organisation.

**(2 marks)**

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**Question 5****(3 marks)**

Describe the role of 'data mining'. Include an example in your response.

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**Question 6****(5 marks)**

- (a) Compare the terms 'referential integrity' and 'domain integrity'. **(2 marks)**

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- (b) Define the following terms in relation to databases. **(3 marks)**

Aggregation: \_\_\_\_\_

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Concatenated field: \_\_\_\_\_

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Calculated field: \_\_\_\_\_

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Question 7

(3 marks)

As a programmer, you have been asked to create an algorithm to hold numerical scores for a basketball team. These scores are then used to calculate the average score for each player. Which data type would be the most appropriate to use in the algorithm? Justify your answer.

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Question 8

(5 marks)

- (a) Outline a purpose for each of the following layers within the Department of Defence (DoD) transmission control protocol/internet protocol (TCP/IP) model. (3 marks)

Transport layer: \_\_\_\_\_

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Network layer: \_\_\_\_\_

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Application layer: \_\_\_\_\_

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- (b) Apart from the number of bits required, identify **two** differences between the IP4 and IP6 protocols. (2 marks)

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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**Question 9****(8 marks)**

- (a) Describe **one** difference between the following programming concepts and identify **one** benefit of each: (4 marks)

- modularisation
- functions.

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- (b) Create the function *SecondsToMinutes*, which will convert seconds to minutes. (4 marks)

The main module is shown below:

```
Main module
begin
    Input(seconds)
    minutes ← SecondsToMinutes(seconds)
    Print(seconds, "equals", minutes)
end.
```

Function: \_\_\_\_\_

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Question 10

(10 marks)

- (a) Explain how a program evaluation review technique (PERT) chart can be used to manage a project. (3 marks)

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- (b) Identify the stage in the system development life cycle (SDLC) where you would draw a PERT chart. (1 mark)

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(c) Draw a PERT chart below illustrating the following information.

(6 marks)

ID	Task	Days	Dependency
0	Begin project		
1	Create schedule	10	0
2	Buy hardware	5	0
3	Programming	20	1
4	Installation	15	2
5	Conversion	5	4
6	Write manual	15	4
7	Test code	20	3
8	Training	5	6
9	Test system	10	7
10	Dummy activity	5	5, 8, 9
11	User test	8	10

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Question 11

(6 marks)

Write an algorithm in pseudocode to:

- store 10 product prices using a one-dimensional array
- find the average price
- print the average price.

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**Question 12**

**(6 marks)**

A business is experiencing slow performance with its network. It has become worse after its recent expansion, with more employees and devices connected to the network.

They have employed your services as a network consultant. You have identified two factors that could be affecting the network – bandwidth and network design.

Describe each of the **two** factors and outline **one** solution for each that could improve the network performance.

Bandwidth: \_\_\_\_\_

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Network design: \_\_\_\_\_

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Question 13

(4 marks)

Describe how the following strategies are used to compromise the security of networks.

Denial of service: \_\_\_\_\_

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IP spoofing: \_\_\_\_\_

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**Question 14****(6 marks)**

Refer to the partial algorithm below.

```

a ← 0
b ← 50
c = a + b
    IF a > 0 THEN
        c = b/a
    ENDIF
Print 'The value of c is' c

```

Input\_num = input ('Enter a number: ')

Denominator = Input\_num/0

Result = b/denominator

Print 'The result is', result

Describe each of the following errors with reference to the partial algorithm above.

Syntax error: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Run-time error: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Logical error: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 15

(7 marks)

- (a) Describe **one** benefit of normalising data in a database to 3<sup>rd</sup> normal form (NF). (2 marks)

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Refer to the unnormalised data below.

Field	Description
StudentName	Student first and surname
StudentNumber	Unique student number
CourseName	Student course name
CourseNumber	Unique course number
Year	Year student is studying
SubjectCode	Unique subject code
SubjectName	Subject name
ProjectCode	Unique project code
ProjectTitle	Project name
ProjectSupervisor	Name of project supervisor

- (b) Normalise the data to 3<sup>rd</sup> normal form (NF). (5 marks)

Note: a student is enrolled in one course. One course has many students. One course has many subjects. One subject has many projects. One project has many students.

**Question 16****(3 marks)**

Explain how a code of conduct policy promotes ethical and lawful use of technology and data.

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**See next page**

Question 17

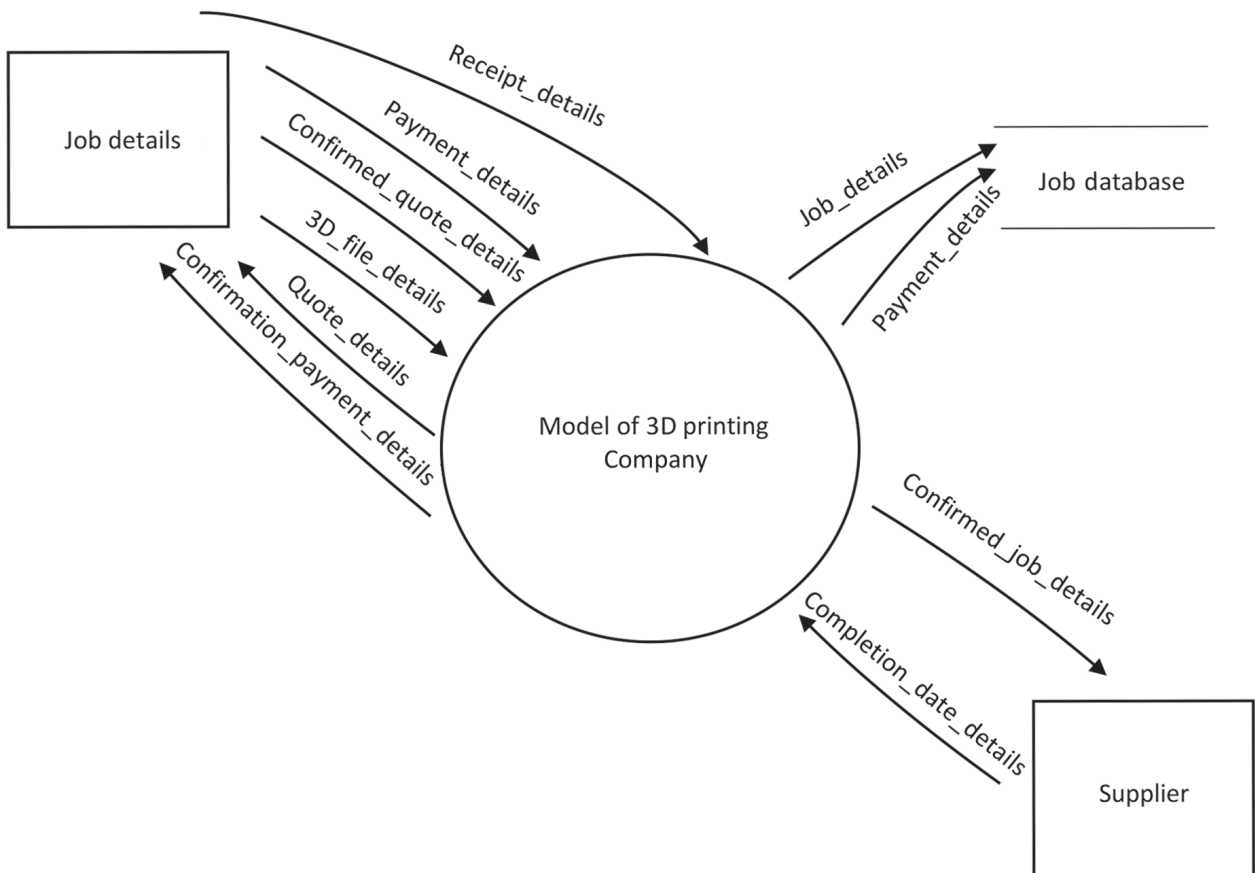
(4 marks)

The context diagram (CD) below is supposed to reflect the following information.

Customers upload their 3D model in a supported file. They select the types of materials, finishings and colours, dimensions and quantity. The business receives the model and prepares a quote. The quote is sent to the customer. The customer confirms the quote, the job is sent to the suppliers. The supplier accepts the job and provides a date for completion. Confirmation and payment details are sent to the customer. The customer pays. The business provides confirmation to the supplier to complete the job. The model is completed and sent to the customer with the receipt. The business pays the supplier.

There are several errors in the CD. Indicate **four** errors on the CD by numbering the errors 1 to 4 and outline each of the errors indicated in the table below. Ensure the number corresponds to the number identified on the CD.

<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	



See next page

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**Question 18**

**(7 marks)**

An insurance company has hired you as a consultant to review its claims processes. You decide to use several data gathering techniques to assess the current situation.

- (a) Describe the following **two** data gathering techniques. (4 marks)

Sampling volume of work processed by system: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Observation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (b) You decide that further information is required and provide a questionnaire to all staff and conduct several interviews. Outline **three** differences between questionnaires and interviews. (3 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Question 19

(4 marks)

(a) Describe **one** difference between the following data validation techniques: (2 marks)

- range checking
- type checking.

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(b) Describe when you would use 'type checking' in an algorithm. (2 marks)

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**Question 20****(4 marks)**

- (a) Describe **one** advantage of implementing a linear (waterfall/cascade) system development methodology. (2 marks)

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- (b) Describe **one** advantage of using an iterative rapid application development (RAD) system development methodology. (2 marks)

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**End of Section One**

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**See next page**

**Section Two: Extended answer****60% (148 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.

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Refer to Source booklet to answer Questions 21 to 24.

**Question 21****(44 marks)**

Refer to the information on pages 2 and 3 of the Source booklet to answer all parts of Question 21.

It has been recommended that the movie theatre company consider conducting a feasibility study before implementing a membership and reservation system.

- (a) Outline **four** components that the feasibility study should address. (4 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

Four: \_\_\_\_\_

\_\_\_\_\_

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The general manager is confused about the type of processing the company should incorporate.

- (b) Describe **two** differences between 'distributed' and 'parallel' processing. (4 marks)

One: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- (c) The general manager has heard about RAID and the different levels. Outline each of the following levels. (3 marks)

Level 0: \_\_\_\_\_  
\_\_\_\_\_

Level 1: \_\_\_\_\_  
\_\_\_\_\_

Level 10: \_\_\_\_\_  
\_\_\_\_\_

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**Question 21** (continued)

- (d) Use the information in the Source booklet on page 3, to create a context diagram (CD) reflecting both the membership section and the reservation and ticket purchase section. (5 marks)

- (e) Draw a Level 0 data flow diagram (DFD) to model the membership and reservation and ticket purchase system as described on page 3 of the Source booklet. (22 marks)

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See next page

Question 21 (continued)

Due to time constraints, the company wants to implement a direct cut change-over method for both locations after development.

- (f) Describe why this is **not** recommended and suggest an appropriate implementation method. (4 marks)

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- (g) The company is considering implementing server virtualisation. Describe why the company considers this to be important. (2 marks)

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**Question 22**

**(37 marks)**

Refer to the information on page 4 of the Source booklet to answer Question 22 parts (a) to (e).

Internal documentation is a requirement in programming to explain the purpose of each part of the code in an algorithm.

(a) Name the appropriate internal documentation below for each segment of code. (4 marks)

I # \_\_\_\_\_

II # \_\_\_\_\_

III # \_\_\_\_\_

IV # \_\_\_\_\_

(b) Explain what would happen if a member tried to search a movie that is not on the company's list. (3 marks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(c) Describe how the fixed (for) loop in the algorithm works. (2 marks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Question 22 (continued)

- (d) Describe how the 'IF' statement in the algorithm determines whether the selected movie is in the list. (2 marks)

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- (e) Explain how you would modify the algorithm to allow the user to select multiple movies from the list, rather than only one. (3 marks)

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Refer to the incomplete algorithm on page 5 of the Source booklet to answer Question 22 parts (f) to (j).

- (f) Write the module *PrintMenu* in pseudocode. (5 marks)

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(g) Write the module *ViewTicketsSold* in pseudocode (2 marks)

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(h) Write the module *ViewTotalSales* in pseudocode. (2 marks)

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(i) Write the function *BuyTicket* in pseudocode. (7 marks)

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Question 22 (continued)

- (j) Write in pseudocode the missing section in the Main Module for the first part of the case statement. (7 marks)

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**Question 23**

**(44 marks)**

It has been suggested that a centralised database system be used for the membership and reservation system.

- (a) Outline **two** reasons why this may have been suggested. (2 marks)

One: \_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_

It has been suggested by an outside consultant that the movie theatre company should use a distributed database to store its movies.

- (b) Describe **two** reasons why a distributed database may not be a good idea. (4 marks)

One: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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Question 23 (continued)

(c) Describe a purpose of a data dictionary in a database. (2 marks)

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(d) List **four** components of a data dictionary in a database. (4 marks)

One: \_\_\_\_\_

Two: \_\_\_\_\_

Three: \_\_\_\_\_

Four: \_\_\_\_\_

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Refer to the information on page 6 in the Source booklet to answer Question 23 part (e).

- (e) Create an entity relationship (ER) diagram for the membership and reservation system.

Use Chen's notation.

(26 marks)

Include the following:

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

You will need to resolve all many-to-many relationships.

Question 23 (continued)

- (f) Describe **two** design considerations that you would consider in assisting the readability and inclusivity of the movie theatre company’s database user interface. (4 marks)

One: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The movie theatre company is concerned about data security.

- (g) Outline **two** methods the company can use to ensure their data is kept secure. (2 marks)

One: \_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_

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**Question 24****(23 marks)**

Refer to the information on page 7 of the Source booklet to answer all parts of this Question.

- (a) Identify **six** recommendations that could be implemented at each cinema location to protect the building and the digital assets. (6 marks)

One: \_\_\_\_\_

Two: \_\_\_\_\_

Three: \_\_\_\_\_

Four: \_\_\_\_\_

Five: \_\_\_\_\_

Six: \_\_\_\_\_

- (b) From your recommendations in part (a), select the **one** which has the highest priority for implementation. Justify your recommendation. (3 marks)

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Question 24 (continued)

The storage requirement for the digital format movies will be considerably large in size as new movies are added and old ones are either removed or archived.

- (c) You decide that a storage area network (SAN) would work best. Justify this decision. (3 marks)

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- (d) The movie theatre company would like you to design a new network to support the move to digital streaming of films. (11 marks)

The requirements of the new network are as follows:

- there are three different locations, two movie theatres and one new central office, each in different geographical locations
- all three locations will be connected via the internet
- the movies will be streamed from the new central office to both locations
- the new office will house the web, streaming and booking servers and the administration PCs, printers and office administration server
- the central office network needs the ability to stream large digital movie files to both movie theatre locations from a single streaming server without interruption
- there is a requirement to stream at different times and concurrently
- the system will require scalable storage for future expansion of the number of movies stored
- digital movies are generally between 90 to 300 GB in size. At present each location on average stores four to eight individual movies at any one time
- staff will use hand-held smart devices to manage entrance to the new e-ticket/online membership system against the bookings database at each movie theatre location
- each movie theatre will have its own box office point of sale (POS) system
- include fibre and wired ethernet transmission medium as appropriate.

Draw using CISCO symbols, the new network diagram on the following page.

Draw your network diagram below.

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**End of questions**







Supplementary page

Question number: \_\_\_\_\_

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