



## Western Australian Certificate of Education ATAR course examination, 2016

### Question/Answer booklet

# COMPUTER SCIENCE

Please place your student identification label in this box

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

### 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.

## 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	73	40
Section Two Extended answer	4	4	110	105	60
<b>Total</b>					100

## Instructions to candidates

1. The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2016*. 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 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. Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.
5. The Source booklet is not to be handed in with your Question/Answer booklet.

**Section One: Short answer****40% (73 Marks)**

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

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Suggested working time: 70 minutes.

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**Question 1****(3 marks)**

- (a) At which stage of the system development life cycle does the changeover to a new system take place? (1 mark)

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A school is about to implement a new system that will manage student records, marks, fees and staff payroll. It has decided to use a 'phased implementation' approach to the changeover.

- (b) What characterises a phased implementation approach? (1 mark)

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- (c) Give **one** reason why phased implementation would be the **best** approach to follow in this case. (1 mark)

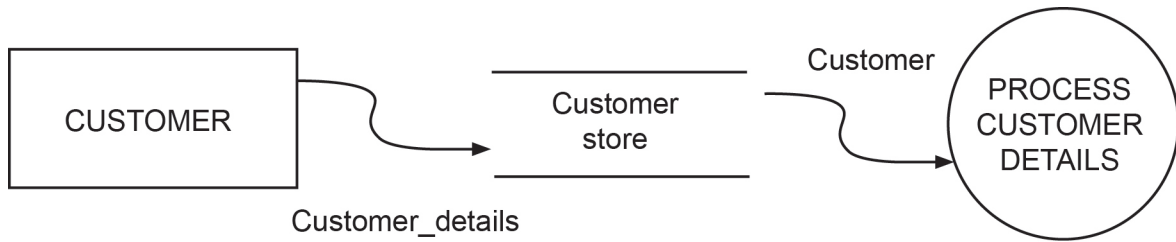
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Question 2

(2 marks)

In the Level 0 data flow diagram below list **two** errors that are a result of **not** following the rules for drawing DFDs.



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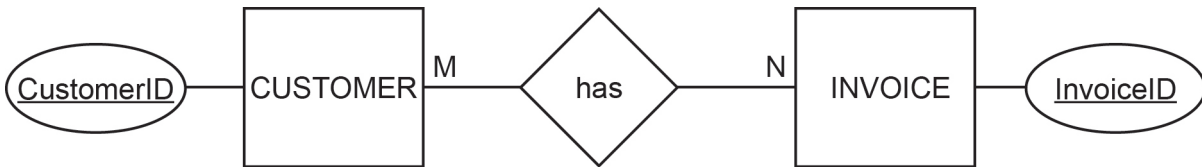
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Question 3

(8 marks)



- (a) To create a model that can be implemented in a relational database the above many to many (M:N) relationship needs to be resolved. Describe the resolution process referring to the unresolved entity relationship diagram above. (2 marks)

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- (b) Redraw the diagram to show the resolved relationship. Include the following: (6 marks)
- entity name
  - relationship
  - cardinality
  - necessary primary and foreign keys.

**Question 4**

**(4 marks)**

The Department of Defense (DoD) transmission control protocol/internet protocol (TCP/IP) model is based on four layers: application layer, transport layer, internet layer and network layer. State the purpose of each layer.

Application layer:

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Transport layer:

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Internet layer:

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Network layer:

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**Question 5****(1 mark)**

Give **one** reason why the table below is unnormalised.

PatientID	Name	Date-Of-Birth	Height (cm)	Weight (kg)	Blood type
21AXC	Adam Lee	21/06/2000	170	60	A
53AGS	Kim Jones	25/09/2001	165	62	APos
21AXC	Adam Lee	21/06/2000	170	55	A

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**Question 6****(2 marks)**

Give **two** differences between executable code and byte code.

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Question 7

(6 marks)

The following pseudocode calculates and outputs an average mark for a group of five students.

Module CalcStudentAvg(Num)

Total  $\leftarrow$  0

Avg  $\leftarrow$  0

For Student  $\leftarrow$  1 to Num

    Input(Mark[Student])

End For

For Student  $\leftarrow$  0 to Num

    Total  $\leftarrow$  Total + (Mark[Student])

End For

Avg  $\leftarrow$  Total/Num

Output(Avg)

End CalcStudentAvg

Module Main

Max  $\leftarrow$  5

Call CalcStudentAvg(Max)

End Main

(a) Identify the logic error in the above pseudocode and explain why it is an error. (2 marks)

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(b) Assume the five values 20, 20, 20, 20 and 20 respectively are input. If the error is not corrected, will the final value of Total be 100? Explain why or why not. (2 marks)

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(c) What type of parameter is Num? (1 mark)

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(d) What type of variable is Avg? (1 mark)

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**Question 8**

**(2 marks)**

List **two** primary functions of a domain name server.

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Question 9

(6 marks)

The Gantt chart shown below is for a web-based information systems project. Analyse the Gantt chart and draw a PERT chart using the data provided.

Task Name	Duration	Start	Finish	Predecessors	25-Jul-16			1-Aug-16			8-Aug-16			15-Aug-16			22-Aug-16			29-Aug-16			5-Sep-16		
					M	T	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	F
1 Opportunity Assessment	3 Days	Wed 27 Jul	Fri 29 Jul																						
2 Data Collection	2 Days	Mon 1 Aug	Tues 2 Aug	1																					
3 Feasibility Study	3 Days	Mon 1 Aug	Wed 3 Aug	1																					
4 Stake Holder Input	3 Days	Wed 3 Aug	Fri 5 Aug	2																					
5 Analysis	4 Days	Mon 8 Aug	Thurs 11 Aug	4																					
6 System Design	4 Days	Fri 12 Aug	Wed 17 Aug	5																					
7 Interface Development	3 Days	Thurs 18 Aug	Mon 22 Aug	6																					
8 Database Programming	6 Days	Thurs 18 Aug	Thurs 25 Aug	6																					
9 User Interface Testing	2 Days	Mon 22 Aug	Wed 23 Aug	7																					
10 Total System Testing	4 Days	Fri 26 Aug	Wed 31 Aug	8																					
11 Implementation & Training	5 Days	Thurs 1 Sept	Wed 7 Sept	10																					

**Question 10****(4 marks)**

When developing a network security policy, it is important to understand the threats that can be made against a network. 'IP spoofing' and 'back doors' are two techniques that can compromise the security of a network. Describe each of these techniques.

IP spoofing:

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Back door:

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**Question 11****(3 marks)**

You are given a list of fifty real numbers that represent sample values of carbon monoxide levels taken from a freeway sensor. Assuming that you will need to perform the same calculation on all members of the list, what data type or structure would be best to hold the list? Explain.

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## Question 12

(9 marks)

Below is an extract from a table a school currently uses to store data on its students and the subjects in which they are enrolled. All fields in the table are required.

StudentID	StudentFirstName	StudentLastName	Year	SubjectCode	Teacher	Room
102345	Mary	Lambert	12	ECO14	Hughes	D12
102345	Mary	Lambert	12	PHYS12	Tan	C16
115678	Tim	Mitchell	10	ENG10	Smith	E15
115678	Tim	Mitchell	10	ECO14	Hughes	D12
115678	Tim	Mitchell	10	HIS17	Johns	G14
145876	Matt	Law	11	ECO14	Hughes	D12
145876	Matt	Law	11	HIS17	Johns	G14
122678	Susie	Jones	12	ECO14	Hughes	D12
122678	Susie	Jones	12	PHYS12	Tan	C16
134889	Michelle	Lee	11	HIS17	Johns	G14
100235	Dean	Gibbs	11	PHYS12	Tan	C16
100235	Dean	Gibbs	11	ECO14	Hughes	D12
119967	Julie	Yap	10	ENG10	Smith	E15

(a) Provide a specific example of how each of the following anomalies could or do occur, using the information from the table above.

(i) Insert anomaly (1 mark)

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(ii) Delete anomaly (1 mark)

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(iii) Update anomaly (1 mark)

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(b) Normalise the data from the table on page 12 to 3NF. Identify primary keys and foreign keys. (6 marks)

The Student entity has been completed for you:

Student (StudentID, StudentFirstname, StudentLastname, Year)

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**Question 13** (3 marks)

Name **one** network protocol for dealing with collisions during transmission in ethernet networks. Describe how this protocol works over ethernet. Expand all acronyms.

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**Question 14**

**(5 marks)**

(a) Define an end user license agreement (EULA).

(2 marks)

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(b) List **three** other types of software licence.

(3 marks)

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**Question 15**

**(4 marks)**

(a) Define 'server virtualisation'.

(2 marks)

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(b) What are **two** benefits of server virtualisation over traditional hardware servers?

(2 marks)

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**Question 16****(1 mark)**

Wireless broadband is often suggested as a viable internet solution for those people who live too far from an exchange to have ADSL as an option. A farmer living 200 km from the city finds that such a wireless plan is not available at his location. Name **one** item of hardware infrastructure that is required in the region in order to provide broadband internet connectivity to his home.

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**Question 17****(1 mark)**

What is the purpose of levelling a data flow diagram?

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**Question 18****(1 mark)**

What element of a DFD maps directly to an entity relationship (ER) diagram?

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**Question 19****(1 mark)**

State **one** ethical responsibility of software users.

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**Question 20****(1 mark)**

State **one** role of an operating system.

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Question 21

(6 marks)

The data for a computer system is stored on one of its servers. The system manager has asked IT Support to confirm that the data is being backed up. She is advised that the server is running RAID 10 and has an incremental backup carried out each evening.

- (a) Describe what is meant by 'RAID 10'. (2 marks)

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- (b) How many hard disks are required to implement RAID 10? \_\_\_\_\_ (1 mark)

- (c) Which files are backed up in an incremental backup scheme? (1 mark)

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- (d) List **two** types of disaster recovery tools. (2 marks)

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**End of Section One**

**See next page**



**Section Two: Extended answer****60% (105 Marks)**

This section has **four (4)** questions. Answer **all** questions. Write your answers in the spaces provided.

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

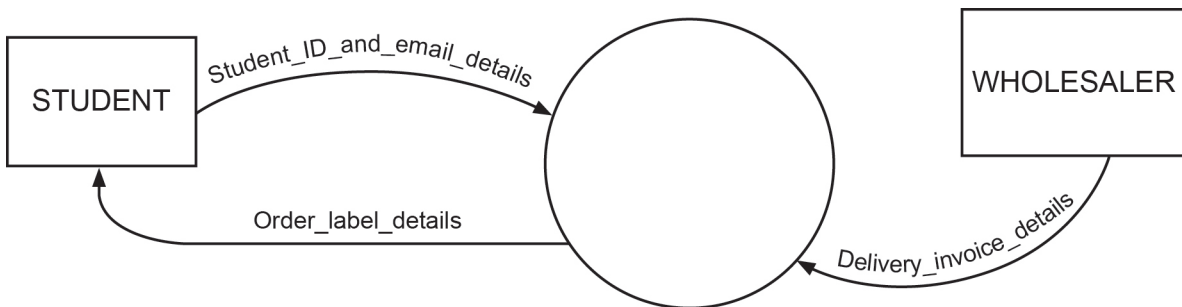
Suggested working time: 110 minutes.

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You will need to refer to the description on page 2 of the Source booklet to answer Questions 22 and 23.

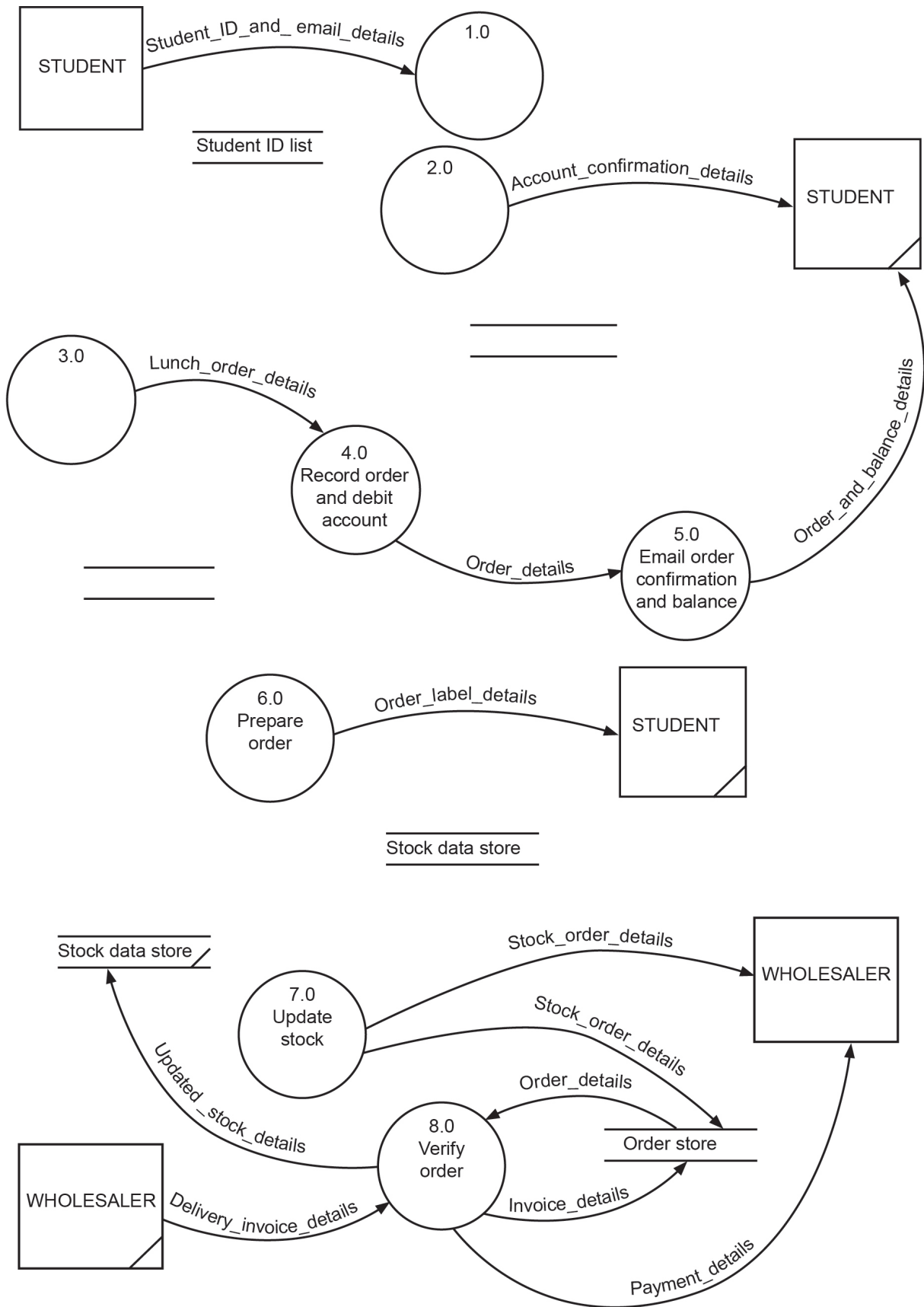
**Question 22****(30 marks)**

- (a) Complete the context diagram below for the Pinnacle Heights Canteen Lunch System (PHCLS). (6 marks)



**See next page**

Question 22 (continued)



See next page

- (b) Complete the Level 0 data flow diagram for the PHCLS on page 18, showing all items labelled correctly. All entities, data stores and processes have been placed on the diagram for you. (16 marks)
- (c) Complete the Level 1 data flow diagram below, which results from expanding process 8.0 – Verify Order. (8 marks)



## Question 23

(30 marks)

The following description describes the entity relationship (ER) diagram for the PHCLS:

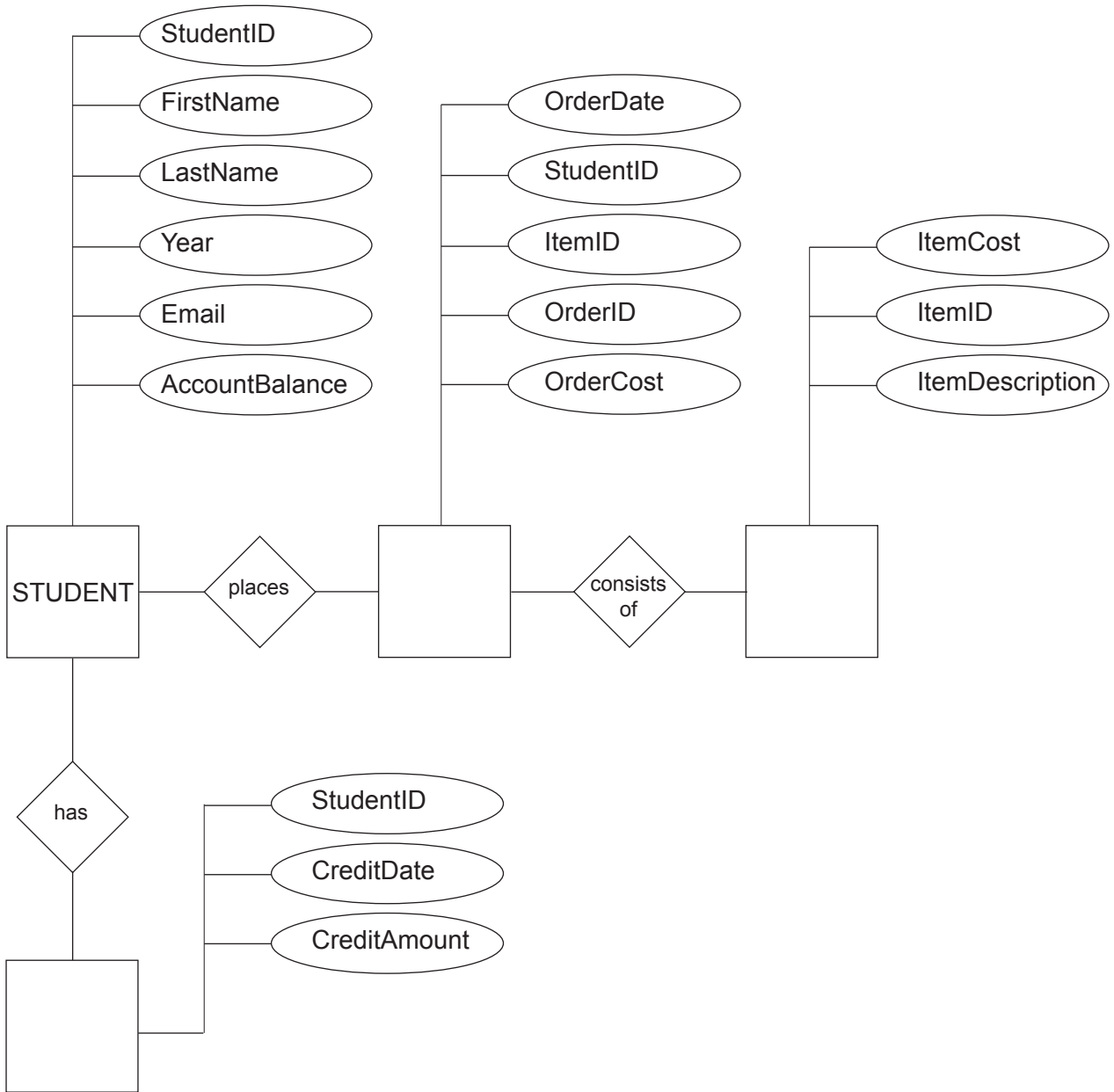
- a student can place many orders but each order is for one student only
- an order can consist of many food items
- there are many food items to choose from to make an order
- one student can have many student credits but each student credit is for one student only.  
Every time a student adds credit the date is recorded.

(a) Complete the ER diagram on page 21, including the following: (12 marks)

- the names of the **three** unnamed entities
- the cardinality
- the primary key(s) for all entities.

(b) Each product is supplied by one wholesaler. Each wholesaler supplies many products.  
Complete the following on the ER diagram: (6 marks)

- add a Wholesaler entity showing the relationship and cardinality
- list the required primary or foreign key(s) for the Wholesaler entity
- indicate any other foreign keys.



**Question 23** (continued)

- (c) State the purpose of a data dictionary. (1 mark)

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- (d) Complete the data dictionary below for the Student entity. (5 marks)

Element name	Data type	Size/ Format	Description	Constraint
StudentID		6	Unique identifier for each student	Required. Automatically created when record added
FirstName	String	25	First name of student	
LastName	String	25	Last of student	Required
Year	String		The year level	Required
Email	String	30		Required. An email confirmation is given for lunch order
AccountBalance		6	The student's cash balance	Required. Automatically retrieved and displayed when student logs in

- (e) State the purpose of the field StudentID. (1 mark)

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- (f) Consider the ER diagram on page 21. For the CreditDate month of June, write a query using structured query language (SQL) that will list the following: (4 marks)

- FirstName
- LastName
- AccountBalance
- CreditAmount.

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- (g) State **one** method that the manager could use to ensure that the network is secure. (1 mark)

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## Question 24

(22 marks)

The school canteen has a policy that the food provided to the students follows the healthy Green/Amber/Red grading system. In this system, a salad is 'Green', ravioli with meat is 'Amber' and a pizza is 'Red'. The website contains some code that grades each order against this scale. Each order is weighted, so that Red-graded orders carry more weight than Amber or Green. The Canteen Manager wishes to profile the daily orders and to know whether the weighted Red-graded orders exceed 40% of the total orders for the day.

Function RedAlert (Red, Amber, Green)

Comment: returns a Boolean result

1 Redvalue  $\leftarrow$  0

2 Ambervalue  $\leftarrow$  0

3 Greenvalue  $\leftarrow$  0

4 Total  $\leftarrow$  0

5 Result  $\leftarrow$  False

6 Redvalue  $\leftarrow$  Red \* 3

7 Ambervalue  $\leftarrow$  Amber \* 2

8 Greenvalue  $\leftarrow$  Green

9 Total  $\leftarrow$  Redvalue + Ambervalue + Greenvalue

10 Fraction  $\leftarrow$  Redvalue/Total

11 If Fraction  $\geq$  0.4 Then Result  $\leftarrow$  True

RedAlert  $\leftarrow$  Result

End Function

- (a) Examine the function above and complete the trace table below to calculate the true/false result for the input parameters 20, 40, 10. (11 marks)

Line#	Redvalue	Ambervalue	Greenvalue	Total	Fraction	Result
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

See next page





Question 25

(23 marks)

IT Support has considered a wired solution or a wireless solution, using Wi-Fi in place of Bluetooth, as alternatives for the student connection to the Pinnacle Heights Canteen Lunch System (PHCLS).

- (a) List **three** reasons why a wired solution using the school's computer laboratories might be preferable to a wireless solution. (3 marks)

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- (b) List **two** ways in which Wi-Fi is different from Bluetooth. (2 marks)

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- (c) The school has chosen a combined wired and Wi-Fi network solution. A student will be able to order lunch using a:
- mobile phone connected to a home Wi-Fi network
  - mobile phone connected to the school Wi-Fi network
  - computer connected to the school's wired network.

For security reasons, any student networks must be separated from other networks in the school.

Draw a labelled network diagram that shows the following:

- a home connection to the PHCLS
- a school Wi-Fi connection to the PHCLS
- a school wired connection to the PHCLS.

(18 marks)









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303 Sevenoaks Street  
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