



COMPUTER SCIENCE

ATAR course examination 2016

Marking Key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

Section One: Short answer

40% (73 Marks)

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)

Description	Marks
Implementation	1
Total	1

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

Description	Marks
Phased means that only one part of the system is implemented at a time	1
Total	1

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

Description	Marks
This approach causes minimum disruption	1
Total	1
Accept any appropriate alternative answers.	

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.



Description	Marks
Customer details data flow going from entity to Data Store	1
The data flow (Customer) from the Customer data store to process	1
Total	2
Accept also: No numbering in process Process is a black hole	

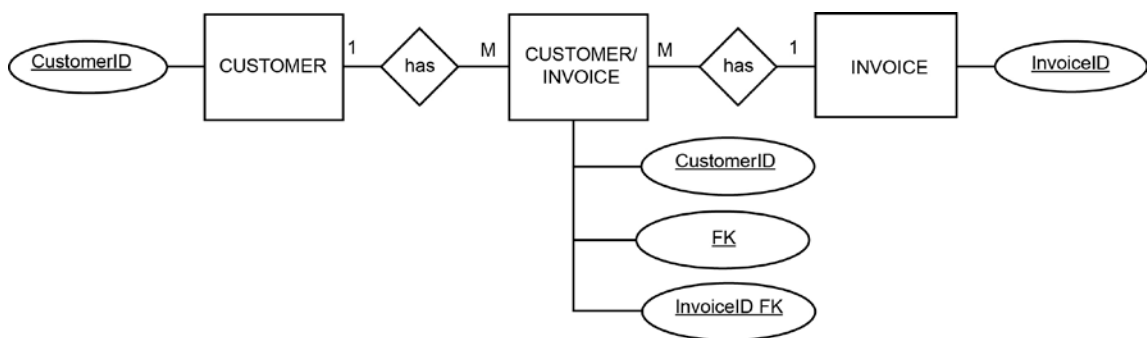
Question 3

(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)

Description	Marks
Create an associative (or joining or linking) entity between the Customer entity and the Invoices entity	1
Break the many to many relationship into two. Accept: create a one to many and many to one relationship Accept: insert foreign key in associative entity	1
Total	2

- (b) Redraw the diagram to show the resolved relationship. Include the following: (6 marks)



Description	Marks
Provides an appropriate entity name Answers could include: • Customer-Invoice (accept joining/linking/associative entity as name) • Bill • Request for payment	1
Provides an appropriate relationship verb Answers could include: • Has • Is-issued-to • issues	1
Provides an appropriate cardinality Answers could include: 1:M for Customer: Customers-Invoice and M:1 for Customer-Invoice: Invoice	1
Provides necessary primary and foreign keys Answers could include: • CustomerID_FK • InvoiceID_FK • Both FKs underlined • Accept new unique primary key in place of underlined FKs	13
Total	6
Accept relevant answers throughout.	

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.

Description	Marks
Application layer: Defines the protocols for node-to-node application communication	1
Transport layer: Sets up level of transmission	1
Internet layer: handles packaging, addressing and routing of data	1
Network layer: supervises data transmission between the host and network	1
Total	4
For network layer answers could include:	
<ul style="list-style-type: none"> manages hardware addresses or MAC addresses defines protocol for physical media for transmission of data 	
Accept any other reasonable answer	

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

Description	Marks
The table contains a repeating group (duplicated data)	1
Total	1
Also accept:	
<ul style="list-style-type: none"> Non-atomic value in the attribute weight (kg) Non-atomic name 	

Question 6**(2 marks)**

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

Description	Marks
Gives two differences, 1 mark each	1-2
Total	2
Examples include:	
<ul style="list-style-type: none"> Executable code is faster than byte code Byte code is more portable than executable code 	
Accept any other relevant answers.	

Question 7

(6 marks)

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

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

Description	Marks
The two FOR loops have different start indices Also Accept: The loop index in the first loop should be zero; or The loop index in the second loop should be one.	1–2
Total	2

- (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)

Description	Marks
No.	1
Explanation: Mark[0] is uninitialised and is used to calculate Total	1
Total	2
Accept also: • Yes • Explanation: Mark could be a global variable that is already initialised Accept any other relevant answers.	

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

Description	Marks
A value parameter	1
Total	1

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

Description	Marks
A local variable	1
Total	1

Question 8

(2 marks)

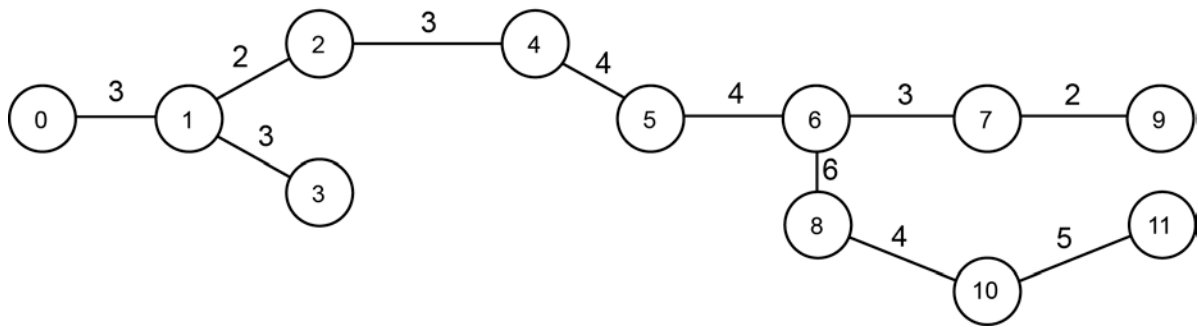
List **two** primary functions of a domain name server.

Description	Marks
Two functions, 1 mark each.	1–2
Total	2
Examples could include: • To map IP addresses to names and criteria • To map directory services • Maintain directory of domain names • To map URL (web address) to IP address Accept any other relevant answers.	

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.



Description	Marks
Order of tasks 0 to 5	1
Order of tasks 6 to 11	1
Branching 1 – 2 – 3	1
Branching 6 -7 – 8	1
Duration 0 – 5	1
Duration 5 – 11	1
Total	6
Note: A chart that begins with any value other than zero can score a maximum of 5 marks	

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.

Description	Marks
IP spoofing:	
A technique used to gain unauthorised access to a computer	1
whereby an intruder sends messages to that computer from a false IP address	1
Back door:	
An undocumented method of gaining access	1
to a program, online service or an entire computer system	1
Total	4
Also accept: IP spoofing is about concealing the identity of the sender or impersonating another computer system	

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.

Description	Marks
Array or list	1
Provides explanation	1–2
Total	3
Example explanation: The data being collected is a simple type (1 mark) and members of the list can be accessed easily (1 mark)	

Question 12

(9 marks)

(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)

Description	Marks
Provides an appropriate user anomaly example	1
Total	1
Example answer: If a new student has been enrolled but has not yet been assigned classes, SubjectCode, Teacher and Room will not have any data Accept any other relevant answers.	

(ii) Delete anomaly (1 mark)

Description	Marks
Provides an appropriate delete anomaly example.	1
Total	1
Example answer: If teacher Smith retired, data would be lost about one student, Julie. Accept any other relevant answers.	

(iii) Update anomaly (1 mark)

Description	Marks
Provides an appropriate update anomaly example	1
Total	1
Example answer: If Hughes leaves and is being replaced by another teacher, multiple records will need to be changed. This could lead to not all data being updated. Accept any other relevant answers.	

- (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)

Description	Marks
Student-Subject (enrolment) entity	1
SubjectCode primary key of Subject entity	1
StudentID_FK	1
SubjectCode_FK	1
Subject entity (1 mark) StudentID_FK and SubjectCode_FK compound primary key (underlined) for Student-Subject entity (1 mark) Or Provides a Link entity that joins Student, Subject, Teacher and Room (1 mark) and contains its own primary key (1 mark)	1-2
Total	6
Answers could include: Student-Subject (StudentID_FK, SubjectCode_FK) Subject (<u>SubjectCode</u> , Teacher, Room)	

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.

Description	Marks
Name a protocol	1
Describes how it works	1-2
Total	3
Example description: Name: carrier sense multiple access/collision detection. When two stations attempt to transmit simultaneously a collision occurs and is detected by all participating stations. After a random time interval, the stations that collided attempt to transmit again.	

Question 14**(5 marks)**

- (a) Define an end user license agreement (EULA). (2 marks)

Description	Marks
Defines EULA	1-2
Total	2
Example definition: An end user license agreement (EULA) describes a contract (agreement) between a software developer and a user of that software. Accept other reasonable alternatives.	

- (b) List **three** other types of software license. (3 marks)

Description	Marks
Lists three licenses, 1 mark each	1–3
Total	3
Examples include: <ul style="list-style-type: none"> • Network • Commercial • Enterprise • Proprietary 	

Question 15 (4 marks)

- (a) Define 'server virtualisation'. (2 marks)

Description	Marks
Defines server virtualisation.	1–2
Total	2
Example definition: Where one or more servers are implemented (1 mark) on the same hardware server (1 mark). Also accept: Where a software application divides one physical server (1 mark) into multiple isolated virtual environments (1 mark)	

- (b) What are **two** benefits of server virtualisation over traditional hardware servers? (2 marks)

Description	Marks
Gives two benefits	1–2
Total	2
Benefits include: <ul style="list-style-type: none"> • Cost saving • Saves space 	

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.

Description	Marks
Provides an appropriate hardware infrastructure solution	1
Total	1
Example: Satellite	

Question 17**(1 mark)**

What is the purpose of levelling a data flow diagram?

Description	Marks
Gives the purpose	1
Total	1
Examples include: <ul style="list-style-type: none"> • A process is required to be broken down to provide more detail. • Complexity makes the diagram hard to understand or interpret 	

Question 18**(1 mark)**

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

Description	Marks
Gives the element	1
Total	1
Examples include: <ul style="list-style-type: none"> • The data entity • data source or data sink 	

Question 19**(1 mark)**

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

Description	Marks
States ethical responsibility	1
Total	1
Example: Users need to ensure that their software is licensed	

Question 20**(1 mark)**

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

Description	Marks
States a role	1
Total	1
Examples include managing: <ul style="list-style-type: none"> • scheduling • concurrency • memory • devices • a file system 	

Question 21

(6 marks)

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

(2 marks)

Description	Marks
Describes RAID 10	1-2
Total	2
Example description: RAID 10 is a combination (1 mark) of RAID 0 (zero) and RAID 1 (one) (1 mark) Accept: Mirroring for RAID 0 Accept: Striping for RAID 1	

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

Description	Marks
4 (four)	1
Total	1

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

(1 mark)

Description	Marks
Any new or changed files since the last backup	1
Total	
Accept any other relevant answers.	

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

(2 marks)

Description	Marks
Lists two disaster recovery tools, 1 mark each	1-2
Total	2
Examples include: <ul style="list-style-type: none"> • online storage • incremental backup • full backup • RAID (level 0, 1, 10) • uninterruptible power supply (UPS) 	

End of Section One

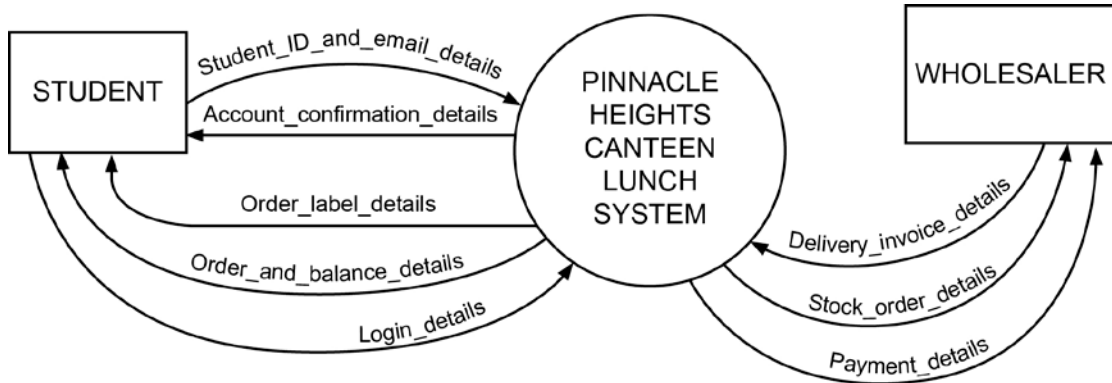
Section Two: Extended answer

60% (105 Marks)

Question 22

(30 marks)

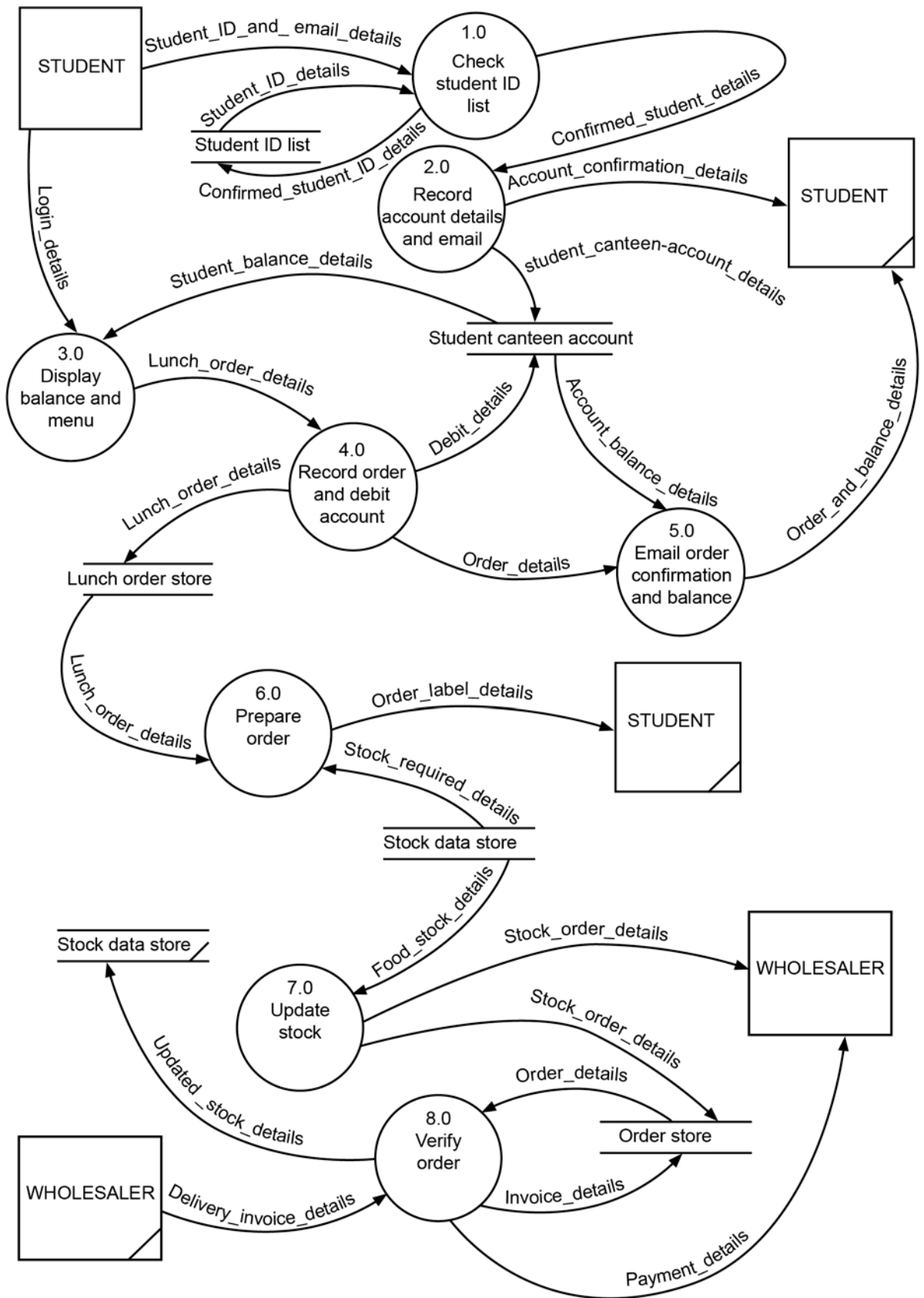
- (a) Complete the context diagram below for the Pinnacle Heights Canteen Lunch System (PHCLS). (6 marks)



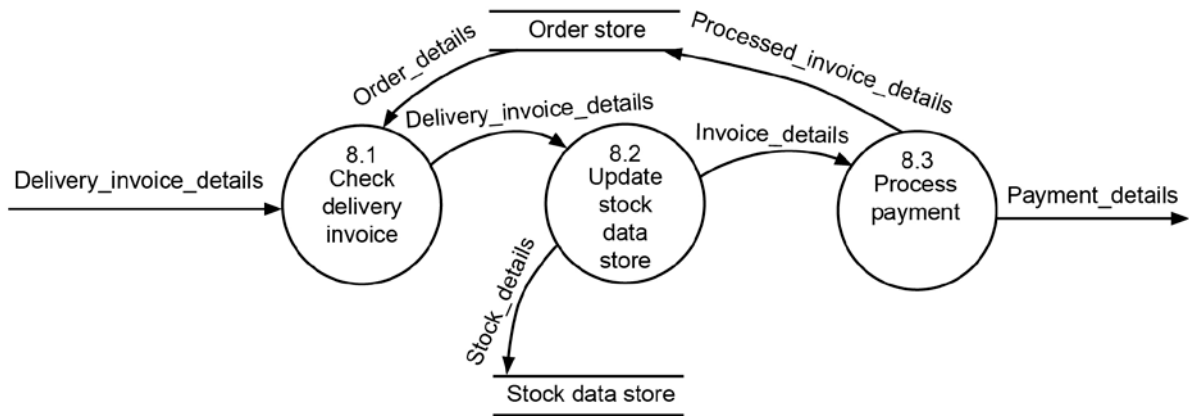
Description	Marks
Appropriate system name	1
Adds another entity (e.g. Registrar)	1
Data flows drawn and labelled appropriately (noun/verb). One mark each up to a maximum of four marks	1-4
Total	6
Answers could include: System name: <ul style="list-style-type: none"> • Pinnacle Heights Canteen System • Canteen System • PHCLS Data flows: <ul style="list-style-type: none"> • Login details • Account confirmation details • Stock order details • Payment details • Order and balance details • Student order details Accept any other relevant answers. Accept also 'info.' in place of 'details'	

- (b) Complete a Level 0 data flow diagram for the PHCLS on page 18, showing all items correctly labelled. All entities, data stores and processes have been placed on the diagram for you. (16 marks)

Description	Marks
Data stores named appropriately given problem context	1–2
Processes named using appropriate verb/noun combinations	1–3
Data flows drawn and named appropriately	1–11
Total	16
<p>Solutions will vary. Answers could include:</p> <p>Data stores:</p> <ul style="list-style-type: none"> • Student Canteen Account • Lunch Order Store <p>Processes:</p> <ul style="list-style-type: none"> • Check Student ID List • Record Account details and Email • Display Balance and Menu <p>Data flows:</p> <ul style="list-style-type: none"> • Login details • Student ID details • Confirmed Student details • Student Canteen Account details • Student Balance details • Account Balance details • Debit details • Lunch Order details (occurs twice) • Stock Required details • Food Stock details <p>Appropriate answers will reflect the information provided.</p>	



(c) Complete the Level 1 data flow diagram below, which results from expanding process 8.0 – Verify Order. (8 marks)



Description	Marks
Process names appropriate and different from level 0 process names	1–3
Data flows drawn and named appropriately	1–5
Total	8
Accept any other relevant answers.	

Question 23

(30 marks)

(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.

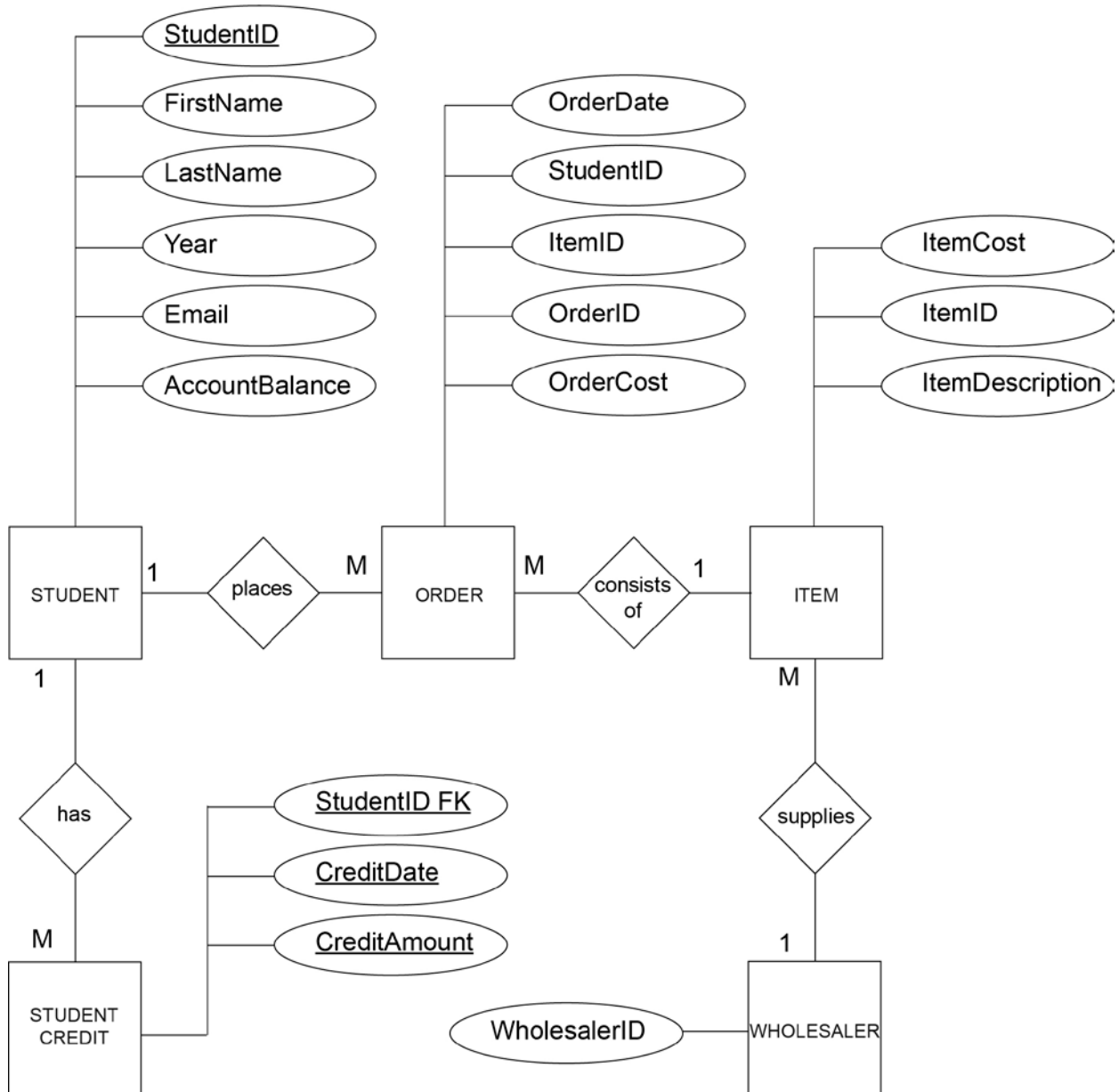
Description	Marks
At least three entities named appropriately given context	1–3
Represents correctly the cardinalities appropriate to the entities	1–3
Primary keys appropriate to entities	1–6
Total	12
Example answer for 12 marks: <ul style="list-style-type: none"> • Order • Student Credit • Item • 1:M for Student:Order • M:1 for Order: Item • 1:M for Student:Student Credit • StudentID for Student entity • OrderID/ItemID_FK for Order entity • ItemID for Item entity • StudentID/Credit date for Student Credit Accept any other relevant answers, e.g. for entity names.	

(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 on the ER diagram, showing the relationship and cardinality
- list the required primary or foreign key(s) for the Wholesaler entity
- indicate any foreign keys.

Description	Marks
Cardinality 1:M Wholesaler to Product	1
Relationship named 'supplies'	1
PK WholesalerID (accept other relevant answer, e.g. SupplierID)	1
StudentID_FK for Order	1
WholesalerID_FK for Item	1
StudentID_FK for Student Credit	1
Total	6
Accept any other relevant verb for relationship and any other relevant answers for entity names that match part (a).	



(c) State the purpose of a data dictionary.

(1 mark)

Description	Marks
Provides a shared understanding of the structure of a database	1
Total	1
Accept any other relevant answers.	

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

(5 marks)

Description	Marks
StudentID: String	1
FirstName: Required	1
Year: 2	1
Email: Email address containing @ sign	1
AccountBalance: Real	1
Total	5
Accept any other reasonable answers e.g. Number for StudentID Currency for AccountBalance Float for AccountBalance	

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)

Description	Marks
A unique identifier for each student	1
Total	1
Answers could include: <ul style="list-style-type: none"> • Primary key Accept any other relevant answers.	

- (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

Description	Marks
SELECT [FirstName], [LastName], [AccountBalance], [CreditAmount]	1
FROM Student, StudentCredit	1–2
WHERE [CreditDate] = 'June'	1
Total	4
Accept any other relevant answers.	

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

Description	Marks
States a method	1
Total	1
Answers could include: <ul style="list-style-type: none"> • Encrypt network traffic • Use of Firewall(s) • Anti-virus software • Password protect the database Accept any other relevant answers.	

Question 24

(22 marks)

- (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)

Description	Marks
One mark for each correct line in the table	1–11
Total	11

Line#	Redvalue	Ambervalue	Greenvalue	Total	Fraction	Result
1	0					
2		0				
3			0			
4				0		
5						False
6	60					
7		80				
8			10			
9				150		
10					0.4	
11						True

- (b) Review of the pseudocode on page 24 has revealed a logic error that has no effect on the trace table. On what line is the error? Write the correct pseudocode. (2 marks)

Description	Marks
Line 11	1
If Fraction > 0.4 Then Result ← True	1
Total	2

(c) Write an algorithm in pseudocode to do the following. Assume that there are three orders for the day. (9 marks)

- read the orders
- total and output the cost of all orders for the day
- calculate and output an average daily spend per student
- test for zero-value orders and do not use them in the calculation of the average daily spend per student.

Description	Marks
Initialising a variable that stores the number of zero-value orders	1
Reading in the orders	1
Calculation correct of total cost	1
Test for zero-value orders (1) and ensure they don't affect the average (1)	1-2
Calculation of average	1
Catch potential division by zero if all orders are blank	1
Output total costs of orders	1
Output average daily spend per student	1
Total	9
Accept any other relevant answers, e.g.	
• Array answer counting from 0 (zero) to NumOrders-1	

AverageCost(NumOrders)

Total ← 0

Average ← 0

Order1 ← 0

Order2 ← 0

Order3 ← 0

Blanks ← 0

Read Order1

Read Order2

Read Order3

If Order1 = 0 Then

Blanks ← Blanks + 1

endif

If Order2 = 0 Then

Blanks ← Blanks + 1

endif

If Order3 = 0 Then

Blanks ← Blanks + 1

endif

Total ← Order1 + Order2 + Order3

If (NumOrders <> Blanks) Then

Average ← Total / (NumOrders – Blanks)

Else

Average ← 0

endif

Output("Total spent today is ", Total)

Output("Average spend per student today is ", Average)

Question 25

(23 marks)

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

Description	Marks
Lists three reasons, 1 mark each	1–3
Total	3
Examples include: <ul style="list-style-type: none"> • Wireless could be intercepted • Wireless is affected by environmental conditions • Wireless could be tampered with Accept any other reasonable answer	

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

Description	Marks
Lists two ways, 1 mark each	1–2
Total	2
Examples include: <ul style="list-style-type: none"> • Wi-Fi has greater range than Bluetooth • Wi-Fi has stronger encryption than Bluetooth Accept any other reasonable answer	

- (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.

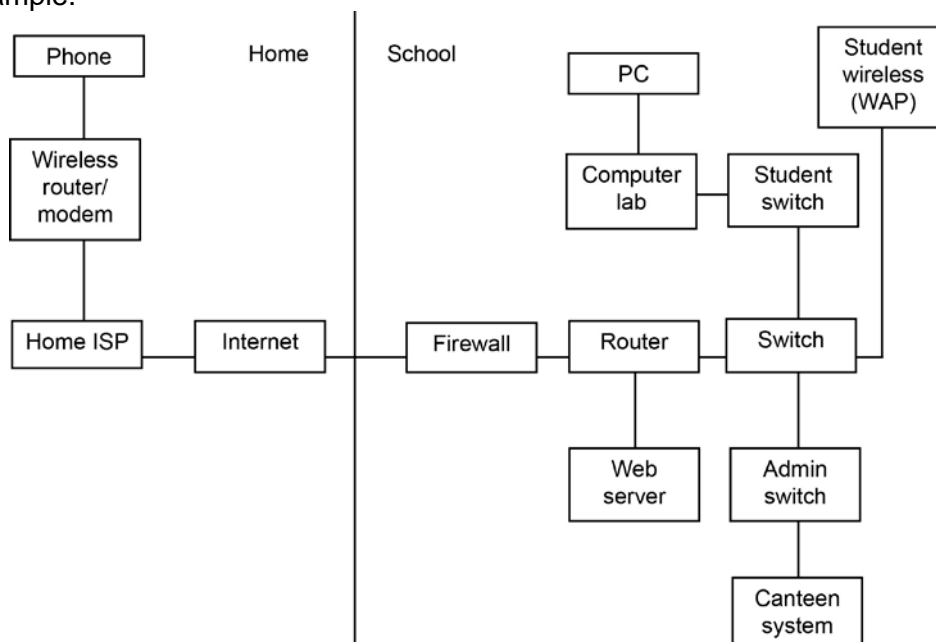
Draw a labelled network diagram that shows the following:

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

(18 marks)

Description	Marks
Provides a viable solution with sequencing of devices for the home connection Appropriate order of components For example: Phone, Home wireless point (home wireless router/modem, cable modem or equivalent), Internet, ISP (OK to include internals of ISP, but not required), Internet, School Firewall, Router, Switch, Canteen System	1–9
Provides a viable solution with sequencing of devices for the school Wi-Fi connection Appropriate order of components For example: Phone, WAP, Switch, Canteen System	1–4
Provides a viable solution with sequencing of devices for the school wired connection Appropriate order of components For example: Devices: Computer, Switch, Canteen System	1–3
Separation of staff/student networks	1
Appropriate use of CISCO conventions	1
Total	18
Accept any other reasonable answers.	

Example:



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