1 (a) Copy and complete the decision table showing all the possible outcomes and results. Ans:

Condition	1	2	3	4	5	6	7	8
Has customer been refused insurance by another company?	Υ	Υ	Υ	Υ	Ν	Ν	Ν	Ν
Is car over 10 years old?	Υ	Υ	Ν	Ν	Υ	Υ	Ν	Ν
Has customer make more than 3 claims previously?	Υ	Ν	Υ	Ν	Υ	Ν	Υ	Ν
Action								
Insurance refused	Х	Х					-	
Insurance without discount available			Х	Х	Х	Х	-	
Insurance with discount available							-	Х
	· ا	11	۲	11	۲	11	^]	11

(b) Simplify your decision table by removing redundancies.

Ans:

Condition	1	2	3	4
Has customer been refused insurance by another company?	Υ	Υ	Ν	Ν
Is car over 10 years old?	Υ	Ν	Υ	Ν
Has customer make more than 3 claims previously?	-	-	-	Ν
Action				
Insurance refused	Х			
Insurance without discount available		Х	Х	
Insurance with discount available				Х
	[1]	[1]

2 (a) Draw a diagram that shows suitable classes and their relationships for a solution to different payment type for guests of different activity that uses OOP techniques. Include appropriate attributes and methods in each class.

Ans:		Guest	
/	0.	Private:	
		nNo	
		sGuest	
		aCode	
		Public:	
		set_hNo()	
		gethNo()	
		sGuest()	
		get_sGuest()	
Class names [1] Private attributes [2] Public methods [2] Arrow:[1]		set_aCode()	
		get_aCode()	
		Payment()	7
			\bigwedge
	Member]	Non_Member
	Private:		Private:
	nVisits		nmVoucher
	Public:		Public:
	get_nVisits ()		set_Vouchor()
	set_nVisits ()		get_Vouchor()
	Payment()]	Payment()

(b) What are the benefits of using OOP? **Ans:**

- Reusability: Programs can be assembled from pre-written software components that can be used in many different applications.
- Extensibility: New software components can be written or developed from existing ones without affecting the origin components

[2]

{6}

[2]

	(i)	Encapsulation	[2]
	A115.	means that the internal representation of an object can't be seen from outside definition. Access to this data is typically only achieved through special methods	of the objects
	(II) Ans:	Inheritance	[2] t class as part
	A10.	of its definition.	
	(iii)	Polymorphism	[2]
	Ans:	specific to the type of object.	the response
	What	do these three features mean?	{14}
3	Decompo and how Ans: Ma Concepts	sition and modularity are important concepts in software development. Explain wh do they benefit in software development. IX 4 marks s of decomposition	at they mean [4]
	The proc decompo	ess of identifying first the major task, them further subtasks within them, is known position or top-down design.	n as functional [1]
	 It allo involv 	ows the programmer to concentrate on the overall design of the algorithm without ved with the details of the lower-level modules.	out getting too
	 Anoth unde 	ner benefit of top-down design is that separate modules, once identified and writ rstood, can be reused, and can be independently modified if necessary.	ten, are easily [1]
	Concepts Modulari form a co	s of modularity. ty refers to the concept of making multiple modules first and then linking and com omplete system.	bining them to [1]
	 Modu 	larity enables re-usability and minimizes duplication.	[1]
4	The follow	ving questions are not related to each other.	1-1
	(a) State Ans: 1 m	the meaning of privacy of data . nark for	[1]
	• Or	Ensuring data can only be accessed by / disclosed to authorised persons	
	• (b) State	Ensuring data cannot be accessed by / disclosed to unauthorised persons e the meaning of integrity of data .	[1]
	Ans: 1 m ●Ensu ●Ensu	nark for each bullet point (max 1) ring the accuracy / completeness / consistency of data (during / after processing) ring the data is up to date	
	(c) What Ans: A b a copy of	is the difference between back up and archive? backup is a copy of your data that is made to protect against loss of that data while f data made for long-term storage and reference.	[1] e an archive is
	(d) What Ans: Ve	is the advantage of version control in software development? rsion control software keeps track of every modification to the code in a s	[2] pecial kind of
	If a mista help	ake is made, developers can turn back the clock and compare earlier versions fix the mistake while minimizing disruption to all team members	of the code to
			{5}

(c) The three key features of the object-oriented approach are often quoted as:

[6]

(a) The server has the IP address 192.168.3.2 5 Explain why this is not an IPv6 address.

Ans: 1 mark for each bullet point (max 2)

- Only has four groups of digits // IPv6 has eight groups
- Uses dotted notation instead of colons
- Because it is a 32 bit / 4 byte address // IPv6 is 128 bits / 16 bytes
- (b) The LAN is set up as a star topology as follow:

Describe the function of a router in the network. Ans:

- 1 mark for each bullet point (max 2)
- Receives packets from internet / external network
- Implements a firewall
- Analyses the destination IP address of each packet
- Forwards the packet towards its destination // send packets onto local network or external network
- ...using the routing table
- Maintains / updates the routing
- Allocates private IP addresses
- Finds the most efficient route to the destination
- Changes the packet format for transmission over the next network //

• Network Address Translation (NAT):NAT is a technique used by routers to allow multiple devices in a private local area network (LAN) to share a single public IP address.

(c) Explain how data is transmitted between the two laptops in the LAN. [2] Ans:

1 mark for each bullet point (max 2)

- The data from the sending laptop is transmitted to the router
- The data has address of recipient
- The router determines recipient's destination address
- ... by using a routing table

The router transmits data directly / only to recipient

(d) What does protocol define in computer networks?

Ans: Protocols define format and order of messages exchanged and the actions taken after messages are sent or received.

(e) Explain the importance of protocol in computer network.

standardization for manufacturers Ans: lt provides а and organizations create to hardware/software/equipment that are compatible to the version used by the current internet. A violation of protocol will lead to a breakdown of communication.

(f) Explain the TCP/IP model and the function of each layer with examples.

Ans: Max 4 marks

The TCP/IP Model separates networking functions into discrete layers. Each layer performs a specific function and is transparent to the layer above it and the layer below it. [1]

- 1. Application Layer: supporting network applications, e.g. FTP, SMTP, HTTP
- 2. Transport Layer: process-to-process data transfer, e.g. TCP, UDP
- Internet Layer: routing of packets from source to destination, e.g. IP [1]
- 4. Network Access Layer: support data transmission across the physical network e.g. Ethernet, Wireless 802.11ac/B/G/N [1]



[2]

[2]

[2]

[2]

[4]

[1]

[1]

(g) A new online (web) form is to be designed to gather data from customers.

Describe the features that must be considered when designing a new form.

Ans:

Three from:

Layout:

Use of house style

(sensible/appropriate) use of white space/spacing

Spaces in fields must be appropriate for the data being collected

Structure of the form:

Order of the fields to be completed must be logical to user

Any connections between fields must be logical/clear/made in the layout

Types of input fields:

User data is collected by use of text fields, checkboxes, radio buttons Field labels must be sensible and clear to users

Action buttons:

Buttons that carry out actions must work and their action must be clear to users

Feedback to users:

User must/should be informed of result of their actions Appropriate message must be clear and simple to understand

Error messages should give information on how to correct error/proceed

Validation of data being entered:

Data should be checked as it is entered to try to ensure it is accurate and reasonable

(h) Explain with any two techniques how the bank could use encryption techniques to attempt to prevent its data from being read by unauthorised people.[2]

Ans:

1 mark for each correct answer up to a maximum of 2.

Six from:

Use of encryption key to scramble/make unreadable the data/files/folders

Only users with encryption key can decrypt the data

Encrypting folders/files containing the data to prevent unauthorised access

Use of encrypted connections via network, e.g. SSL, VPNs

Encryption occurs at the network transfer level (layers 3 and 4) of the TCP/IP[OSI] model

... using IPsec to create encrypted packets for transmission

Data only encrypted during transmission on network

(i) Identity theft means one of the following:

Describe two impacts of identity theft on individuals.

Ans:

Two from e.g.:

- Use of victim's identity when committing a crime/being questioned about a crime can bring innocent victim under suspicion/ investigation/ prosecution for these crimes
- Difficult to prove innocence of crime when victim of ID theft/ may have crimes/ incidents recorded
 against name on police records/ may be repeatedly accused of other crimes and suffer continued
 distress
- Victim may be refused credit/ finance/ credit cards on basis of incorrect data stored by financial institutions (due to (fraudulent) use of ID by others)
- Victims find it difficult to correct false information held by government/ credit/ security institutions
- Victims can be left financially liable for fraudulent transactions/ debts/ purchases/ taxes of others (who have stolen/ used their ID)
- Innocent individuals can be confused (in eyes of law enforcement/government agencies) with synthetic identities
- Innocent victims may have false medical data added to their records when the identity thief uses their ID to gain access to medical services/insurance resulting in incorrect medical diagnosis/ treatments
- Victims can be left psychologically harmed/ mental health issues (by theft of ID) Adults may discover that they were victims of identity theft as a child/ children's ID stolen and used before victim's adulthood so when child comes of age/ reaches legal adulthood they have debts/ financial harm/ criminal records that are not theirs.

6. (a) Describe, with the **aid of a diagram**, the data structure called a linked list. Ans:



(c) An alternative type of list structure is one whose data items are always held in a contiguous area of store (an array). Give one advantage and one disadvantage that this has over the linked list organisation.

Ans: Max 2 marks

1 mark for an advantage and 1 for a disadvantage
Advantages All high-level languages support arrays but not all support pointers
Arrays are easier to program
Can go directly to a data item without going through preceding items

Disadvantages -Static, so must know amount of store needed early on Can't grow as more data is needed Can waste space Cannot re-use unwanted space [4]

7	(a) Copy and complete the pseudocode Push() to push a Ans:	n item into Stack.	[3]
	One mark for each correctly completed line (Max 3)		
	PROCEDURE Push (NewItem: REAL)		
	IF TopPointer < MaxSize THEN	[1]	
	Stack[TopPointer]	[1]	
	ELSE OUTPUT "The stack is full - error"	[1]	
	ENDIF ENDPROCEDURE		
	(b) Copy and complete the pseudocode function Pop (() to pop an item from Stack.	[5]
	One mark for each correctly completed line (Max 5) // popping an item from the stack		
	FUNCTION Pop() RETURNS REAL		[1]
	DECLARE Item : REAL		
	IF TopPointer >= BasePointer THEN		[1]
	Item < Stack[TopPointer]		[1]
	TopPointer 🗲 TopPointer - 1		[1]
	ELSE		
	OUTPUT "The stack is empty - error	"	
	RETURN Item		[1]
	ENDFUNCTION		
	 Ans: One mark for linked list and one mark for array (Max 2 Linked list A linked list is a dynamic data structure / not restricted list Has greater freedom to expand or contract by additional c	2) cted in size ing or removing nodes as nece d of moving the data).	[1] essary [1] [1]
	An array is a static data structure generally fixed in	size	[1]
	• When the array is full, the stack cannot be extende	d any further.	[1]
	(d) Explain how to make use of a stack when translatine Ans:	ng recursive programming cod	le. [3]
	One mark per mark point (Max 3)		
	•push return addresses / values of local variat	ples onto a stack	[1]
	with each recursive call // to set up winding		[1]
	•pop return addresses / values of local variable		[]
	•alter the base case is reached // to implement	it unwinding.	[']
	(e) Compare and contrast the queue and stack Abstra Ans:	ict Data Types (ADT).	[3]
	One mark per mark point (Max 3)		
	 A queue is a first in first out / FIFO data structure a structure // Data is removed from a queue in the or reverse order to which it is received 	Ind a stack is a first in last out rder it is received and remove	/ FILO / LIFO data d from a stack in the [1]
	• Both ADTs can vary in size / are of indeterminate I	ength	[1]
	• Data is popped and pushed (onto/from a stack) at (to/from a queue) at different/opposite ends // a qu	the same end but it is enqueue eue has two accessible ends	ed and dequeued and a stack has
	only one		[1]
	A stack has only one moveable pointer whereas a	queue has two.	[1]

8	(a) Outline what is meant by the term collision in this context. Ans:	[2]				
	 One mark per mark point (Max 2) A collision is when the two values / data items in the key field for two records (pass through a hashing algorithm and) result in the same hash value [1] so the location identified (by the hashing algorithm) may already be in use // two records can occupy the same address. [1] 					
	(b) Explain how a collision can be dealt with when writing records to a random file.	[3]				
	One mark per mark point (Max 3)					
	A process of collision resolution is used [1]					
	Start at the original hashed storage space [1]					
	• go through the following spaces in a linear fashion [1]					
	 and store the data item in the first available slot [1] 					
	OR					
	• Search the overflow area [1]					
	go through the following spaces in a linear fashion [1]					
	•and store the data item in the first available slot. [1]					
	OR					
	Each storage space holds a reference to a collection / chain of items [1] [1] [1] [1] [1] [1] [1] [1] [1] [1]					
	 which can be searched individually. The data item is stored in the first available space in this chain [1] 					
		{5}				
9	(a) Create an entity-relationship (ER) diagram for the four-table database.	[3]				
	School Student Marks > Question					
	1 mark for each correct relationship: total 3 marks					
	T mark for each correct relationship; total 3 marks					
	(b) Ans: 1 mark for each table	[4]				
	Student (Student ID, Name, School ID*)					
	Question(QuestionID, Marks)					
	Marks(<u>StudentID*, QuestionID</u> *, Marks Scored)					
	(c) Write an SQL query that will output the top 3 students' details and their individual total score fo	r the				
	school "Dunman High School".	[7]				
	Ans:					
	SELECT "School Name", Student. "Student ID", Name, Sum ("Marks Scored")	4")]				
	EROM Student Correct ions					
	INNER JOIN School					
	ON Student."School ID" = School."School ID"					
	INNER JOIN Marks					
	UN SLUGENT."STUGENT ID" = MARKS."STUGENT ID" WHERE "School Name" = "Dunman High School"					
	[1 mark for correct WHERE condition]					
	GROUP BY Student."Student ID" [1 mark for correct GROUP BY]					
	ORDER BY Sum("Marks Scored") DESC [1 mark for correct ORDER BY]					
	LIMIT 3; [1 mark for correct LIMIT]					

(d) Ans:

All columns in all 4 tables are atomic as there are no multi-valued columns. [1 mark]

- Every non-key attributes are fully dependent on the entire primary key and there is no transitive dependencies. [1 mark]
- 1 mark for giving any example based on the question.

{17}

[3]

Total : 100