

ANSWERS

Answer 1

7(a)	1 mark per bullet point to max 2 <ul style="list-style-type: none"> • Reduced data redundancy • Reduced data dependency • Improved data integrity • Improved data privacy • Program-data independence • Ability to create ad hoc queries 	2
7(b)	1 mark for each correct link <pre> classDiagram INSTRUCTOR --> LESSON LESSON --> STUDENT INSTRUCTOR --> INSTRUCTOR_CAR INSTRUCTOR_CAR --> CAR </pre>	4
7(c)	1 mark for each correctly completed statement <ul style="list-style-type: none"> • CREATE (line 1) • INTEGER (line 6) • PRIMARY KEY (line 7) <pre> CREATE TABLE INSTRUCTOR(InstructorID VARCHAR(5), FirstName VARCHAR(15), LastName VARCHAR(15), DateOfBirth DATE, Level INTEGER, PRIMARY KEY (InstructorID)); </pre>	3
7(d)	1 mark per bullet point <ul style="list-style-type: none"> • Alter table student • Add an appropriate identifier with suitable data type <pre> ALTER TABLE STUDENT ADD TelNum VARCHAR; </pre>	2

7(e)	1 mark per bullet point <ul style="list-style-type: none"> Select lesson date and lesson time From table LESSON Where InstructorID = "Ins01" And lesson date is greater than today's date <pre> SELECT LessonDate, LessonTime FROM LESSON WHERE InstructorID = "Ins01" AND LessonDate > #####; </pre>	4
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Answer 2

Question	Answer	Marks								
6(a)	1 mark per bullet point to max 2 <ul style="list-style-type: none">There are partial dependencies in the SOFTWARE_PURCHASED table // SoftwareDescription is dependent only on SoftwareName and not both SoftwareName and CustomerIDThere is a non-key dependency in the SOFTWARE_PURCHASED table // LicenceCost is dependent on LicenceType	2								
6(b)	1 mark for a suitable example for each <table><tr><th>Term</th><th>Example</th></tr><tr><td>Entity</td><td>SOFTWARE_PURCHASED //CUSTOMER_DETAILS</td></tr><tr><td>Foreign Key</td><td>CustomerID (in SOFTWARE_PURCHASED table)</td></tr><tr><td>Attribute</td><td>Any valid example of an attribute from the tables</td></tr></table>	Term	Example	Entity	SOFTWARE_PURCHASED //CUSTOMER_DETAILS	Foreign Key	CustomerID (in SOFTWARE_PURCHASED table)	Attribute	Any valid example of an attribute from the tables	3
Term	Example									
Entity	SOFTWARE_PURCHASED //CUSTOMER_DETAILS									
Foreign Key	CustomerID (in SOFTWARE_PURCHASED table)									
Attribute	Any valid example of an attribute from the tables									
6(c)(i)	1 mark for each correct entry (in bold) <pre>CREATE TABLE GAME_DEVELOPMENT (GameName VarChar, Genre VarChar, TeamNumber Integer, DevelopmentStage VarChar, ManagerID VarChar, PRIMARY KEY (GameName));</pre>	5								
6(c)(ii)	1 mark for each correct entry (shown in brackets) <pre>SELECT (1) GameName, Genre, TeamNumber FROM GAME_DEVELOPMENT, PRODUCT_MANAGER WHERE PRODUCT_MANAGER.FirstName = "James" AND PRODUCT_MANAGER.SecondName = "Fitz" AND PRODUCT_MANAGER.ManagerID (1) = GAME_DEVELOPMENT.ManagerID (1) ;</pre>	3								

Answer 3

Question	Answer	Marks														
6(a)	<p>1 mark for each correct line</p> <table><thead><tr><th>Database Term</th><th>Description</th></tr></thead><tbody><tr><td>Primary key</td><td>A field in one table that links to a primary key in another table</td></tr><tr><td>Attribute</td><td>A collection of records and tables</td></tr><tr><td>Foreign key</td><td>The type of data that is being stored</td></tr><tr><td>Entity</td><td>A unique identifier for each tuple</td></tr><tr><td></td><td>A data item, represented as a field within a table</td></tr><tr><td></td><td>The concept or object in the system that we want to model and store information about</td></tr></tbody></table>	Database Term	Description	Primary key	A field in one table that links to a primary key in another table	Attribute	A collection of records and tables	Foreign key	The type of data that is being stored	Entity	A unique identifier for each tuple		A data item, represented as a field within a table		The concept or object in the system that we want to model and store information about	4
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Entity	A unique identifier for each tuple															
	A data item, represented as a field within a table															
	The concept or object in the system that we want to model and store information about															
6(b)	<p>1 mark per task to max 3</p> <ul style="list-style-type: none">• Create a table• Set up relationships between tables• Create / design a form• Create / design a report• Create / design a query (NOT run a query)	3														
6(c)(i)	<p>1 mark for each completed line</p> <pre>CREATE TABLE ROOM(RoomNumber Integer, RoomType Varchar, PRIMARY KEY (RoomNumber));</pre>	3														
6(c)(ii)	<p>1 mark for each completed line</p> <pre>INSERT INTO ROOM VALUES (5, "Double");</pre>	2														

Question	Answer	Marks
6(c)(iii)	1 mark per bullet point <ul style="list-style-type: none"> • Alter table booking • Add number of nights with appropriate field name and data type <pre>ALTER TABLE BOOKING ADD NumberNights Integer;</pre>	2

Answer 4

2(b)(i)	1 mark per bullet point to max 3 <ul style="list-style-type: none"> <input type="checkbox"/> Data redundancy // data is repeated in more than one file <input type="checkbox"/> Data dependency // changes to data means changes to programs accessing that data <input type="checkbox"/> Lack of data integrity // entries that should be the same can be different in different places <input type="checkbox"/> Lack of data privacy // all users have access to all data if a single flat file 	3
2(b)(ii)	1 mark for each correct name, 1 mark for each matching description, max 2 marks per level <ul style="list-style-type: none"> <input type="checkbox"/> External <input type="checkbox"/> The individual's view(s) of the database <input type="checkbox"/> Conceptual <input type="checkbox"/> Describes the data as seen by the applications making use of the DBMS <input type="checkbox"/> Describes the 'views' which users of the database might have <input type="checkbox"/> Physical / Internal <input type="checkbox"/> Describes how the data will be stored on the physical media <input type="checkbox"/> Logical <input type="checkbox"/> Describes how the relationships will be implemented in the logical structure of the database 	4
2(c)(i)	1-to-many // 1 customer to/has many licences	1
2(c)(ii)	1 mark per bullet point <ul style="list-style-type: none"> <input type="checkbox"/> <u>CustomerID</u> is the Primary key in <u>CUSTOMER</u> table <input type="checkbox"/> Links to <u>CustomerID</u> as a Foreign key in <u>LICENCE</u> table 	2
2(c)(iii)	1 mark per bullet point <ul style="list-style-type: none"> <input type="checkbox"/> Select with correct 5 fields <input type="checkbox"/> From LICENCE <input type="checkbox"/> Where ExpiryDate <= '31/12/2019' (any appropriate date type) <input type="checkbox"/> Group by CustomerID <input type="checkbox"/> Order by Cost (with or without ASC, but not DESC) <pre>SELECT CustomerID, SoftwareID, LicenceType, Cost, ExpiryDate FROM LICENCE WHERE ExpiryDate <= '31/12/2019' GROUP BY CustomerID ORDER BY Cost;</pre>	5

Answer 5

3(a)(i)	1 mark per bullet point <ul style="list-style-type: none"> <input type="checkbox"/> Stores all the information about the database // data about the data // metadata about the data <input type="checkbox"/> For example, fields, data types, validation, keys 	2
3(a)(ii)	1 mark per bullet point to max 2 <ul style="list-style-type: none"> <input type="checkbox"/> Allows the user to enter criteria <input type="checkbox"/> Searches for data which meets the entered criteria <input type="checkbox"/> Organises the results to be displayed to the user 	2
3(b)	1 mark per bullet point to max 2 <ul style="list-style-type: none"> <input type="checkbox"/> Primary key uniquely identifies each tuple // Each tuple in the table is unique <input type="checkbox"/> Primary key can be used as a foreign key in another table <input type="checkbox"/> to form a link/relationship between the tables <p>By example:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Identification of a primary key in a table <input type="checkbox"/> Describing <u>that</u> primary key in another table as a foreign key 	2
3(c)	1 mark for each correct link <pre> graph TD EMPLOYEE_DATA --> DEPARTMENT_MANAGER EMPLOYEE_DATA --> DEPARTMENT DEPARTMENT_MANAGER --> DEPARTMENT </pre>	3
3(d)	1 mark per bullet point to max 3 <ul style="list-style-type: none"> <input type="checkbox"/> There are no repeating groups (1NF) <input type="checkbox"/> There are no partial dependencies (2NF) <input type="checkbox"/> There are no non-key dependencies // There are no transitive dependencies (3NF) 	3
3(e)(i)	1 mark for correct answer <pre>CREATE DATABASE EMPLOYEES;</pre>	1
3(e)(ii)	1 mark per bullet <ul style="list-style-type: none"> <input type="checkbox"/> Create table EMPLOYEE_DATA with open and close brackets <input type="checkbox"/> EmployeeID as VarChar restricted to max 7, Gender as a VarChar restricted to max 6, DepartmentNumber as a VarChar restricted to max 2 <input type="checkbox"/> FirstName and LastName as VarChar (any max lengths must be reasonable) <input type="checkbox"/> Date of birth as Date <input type="checkbox"/> Declaring EmployeeID as PK <pre>CREATE TABLE EMPLOYEE_DATA (EmployeeID VarChar(7), FirstName VarChar, LastName VarChar, DateOfBirth Date, Gender VarChar(6), DepartmentNumber VarChar(2), PRIMARY KEY (EmployeeID));</pre>	5

Question	Answer	Marks
3(e)(iii)	1 mark per bullet <ul style="list-style-type: none"> <input type="checkbox"/> Select FirstName and LastName only <input type="checkbox"/> From both tables <input type="checkbox"/> Where DepartmentName = "Finance" <input type="checkbox"/> AND Gender = "Female" <input type="checkbox"/> Joining tables (either AND, or inner join) <pre> SELECT FirstName, LastName FROM EMPLOYEE_DATA, DEPARTMENT WHERE DepartmentName = "Finance" AND Gender = "Female" AND DEPARTMENT.DepartmentNumber = EMPLOYEE_DATA.DepartmentNumber; </pre>	5

Answer 6

5(a)(i)	1 mark for correct answer <u>Repeated</u> / <u>duplicated</u> data	1
5(a)(ii)	1 mark per bullet point <ul style="list-style-type: none"> • Because each record/piece of data is stored once <u>and</u> is referenced by a (primary) key • Because data is stored in individual tables • ...and the tables are linked by relationships • By the proper use of Primary and Foreign keys • By enforcing referential integrity • By going through the normalisation process 	3
5(b)(i)	1 mark per bullet point <ul style="list-style-type: none"> • Security ensures that data is safe from unauthorised access // safe from loss • Integrity ensures that data is accurate / consistent / up to date 	2
5(b)(ii)	1 mark for naming, 1 mark for description For example: <ul style="list-style-type: none"> • Access rights // User accounts • Restrict actions (e.g. read / read-write) of specific users // unauthorised users cannot access the database • Views • Restrict which parts of the database specific users can see • Password // Biometrics // PIN code • Prevents unauthorised access • Automatic Backup • Create regular copies of data in case of loss • Encryption • Data is incomprehensible to unauthorised users 	4
5(b)(iii)	1 mark per bullet <ul style="list-style-type: none"> • Query Processor • Developer Interface 	2

Answer 7

4(d)(i)	1 mark per table <input type="checkbox"/> Table CUSTOMER with fields FirstName, LastName, DateOfBirth, CustomerID <input type="checkbox"/> Table ACCOUNT_TYPE with fields AccountID, Name, Bonus <input type="checkbox"/> Table CUSTOMER_ACCOUNT with fields ID, CustomerID, AccountID, Amount CUSTOMER (<u>CustomerID</u> , FirstName, LastName, DateOfBirth) ACCOUNT_TYPE (<u>AccountID</u> , Name, Bonus) CUSTOMER_ACCOUNT (<u>ID</u> , CustomerID, AccountID, Amount)	3								
4(d)(ii)	1 mark for 1 or 2 correct Primary Keys, 2 marks for 3 correct Primary Keys CUSTOMER: CustomerID ACCOUNT_TYPE: AccountID CUSTOMER_ACCOUNT: ID	2								
4(d)(iii)	1 mark for both table name and Foreign Key Table: CUSTOMER_ACCOUNT Foreign Key: CustomerID / AccountID	1								
4(d)(iv)	1 mark for each correct term <table><tr><th>Definition</th><th>Term</th></tr><tr><td>All the data about one entity</td><td>Table / Relation</td></tr><tr><td>The data in one row of a table</td><td>Tuple / Record</td></tr><tr><td>A column or field in a table</td><td>Attribute</td></tr></table>	Definition	Term	All the data about one entity	Table / Relation	The data in one row of a table	Tuple / Record	A column or field in a table	Attribute	3
Definition	Term									
All the data about one entity	Table / Relation									
The data in one row of a table	Tuple / Record									
A column or field in a table	Attribute									

Answer 8

4(a)(i)	<p>1 mark per bullet point, max 3 marks from any group to max 4</p> <ul style="list-style-type: none"> <input type="checkbox"/> Multiple tables are linked together <input type="checkbox"/> ... which eliminates / reduces data redundancy / duplication <input type="checkbox"/> ... and increases <u>data</u> integrity / consistency <input type="checkbox"/> ... which reduces compatibility issues <input type="checkbox"/> ... so data need only be updated once <input type="checkbox"/> ... and associated data will be automatically updated // referential integrity can be enforced <input type="checkbox"/> ... which eliminates unproductive maintenance // which makes it easier to maintain the data <input type="checkbox"/> Program-data independence means that <input type="checkbox"/> ... the structure of data can change and does not affect program <input type="checkbox"/> ... the structure of programs can change and does not affect data <input type="checkbox"/> ... the data can be accessed by any appropriate program <input type="checkbox"/> Allows concurrent access to data <input type="checkbox"/> ... by the use of record locking <input type="checkbox"/> ... by restricting over-writing changes <input type="checkbox"/> Complex queries can be more easily written <input type="checkbox"/> ... to search / find specific data // specific example related to the sports club <input type="checkbox"/> Different users can be given different access rights <input type="checkbox"/> ... which improves security <input type="checkbox"/> Different users can be given different views of the data <input type="checkbox"/> ... so they do not see confidential information <input type="checkbox"/> ... and data privacy is maintained <input type="checkbox"/> ... accept a valid example related to the sports club 	4
4(a)(ii)	<p>1 mark for each word in the correct position</p> <p>For a database to be in First Normal Form (1NF) there must be no repeating groups of attributes.</p> <p>For a database to be in Second Normal Form (2NF), it must be in 1NF, and contain no partial key dependencies.</p> <p>For a database to be in Third Normal Form (3NF), it must be in 2NF, and all attributes must be fully dependent on the primary key.</p>	4

4(b)(i)	<p>1 mark for SESSION to MEMBER_SESSION (one-to-many) 1 mark for TRAINER to SESSION_TRAINER (one-to-many)</p> <pre> graph TD MEMBER --> MEMBER_SESSION SESSION --> MEMBER_SESSION SESSION --> SESSION_TRAINER TRAINER --> SESSION_TRAINER </pre>	2
4(b)(ii)	CREATE DATABASE SPORTS_CLUB;	1
4(b)(iii)	<p>1 mark per bullet point</p> <ul style="list-style-type: none"> □ CREATE TABLE SESSION and (); □ SessionID as char(4) / varchar / varchar(4) / text and Description as varchar / varchar(x) / char(x) / text □ SessionDate as date and SessionTime as time □ NumberMembers as integer / integer(2) / int / int(2) □ SessionID set as a Primary Key <p>Example 1:</p> <pre> CREATE TABLE SESSION(SessionID Char(4), Description Varchar, SessionDate Date, SessionTime Time, NumberMembers Integer, PRIMARY KEY (SessionID)); </pre> <p>Example 2:</p> <pre> CREATE TABLE SESSION(SessionID Char(4) NOT NULL PRIMARY KEY, Description Varchar, SessionDate Date, SessionTime Time, NumberMembers Integer); </pre>	5
4(b)(iv)	<p>1 mark per bullet point</p> <ul style="list-style-type: none"> □ Select FirstName and comma and LastName □ From MEMBER □ Where MembershipType = "Peak" <pre> SELECT FirstName, LastName FROM MEMBER WHERE MembershipType = "Peak"; </pre>	3

Answer 9

3(a)(i)	1 mark per table <ul style="list-style-type: none"> <input type="checkbox"/> CUSTOMER table has at least customer ID, customer name, address and contact details <input type="checkbox"/> ROOM has at least room number, room type, <input type="checkbox"/> BOOKING has at least booking ID, room number, customer ID, start date, number of nights <p>CUSTOMER (<u>CustomerID</u>, Name, Address, ContactDetails)</p> <p>ROOM (RoomNumber, RoomType)</p> <p>BOOKING (BookingID, RoomNumber, CustomerID, StartDate, NumberNights)</p>	3															
3(a)(ii)	1 mark for 1 or 2 correct Primary Keys, 2 marks for 3 correct Primary Keys <p>CUSTOMER: CustomerID</p> <p>ROOM: RoomNumber</p> <p>BOOKING: BookingID</p>	2															
3(a)(iii)	1 mark for both table name and Foreign Key <p>Table: BOOKING</p> <p>Foreign Key: CustomerID / RoomNumber</p>	1															
3(b)	1 mark per bullet point to max 2 plus 1 mark for suitable example for each DBMS tool <p>Developer Interface</p> <ul style="list-style-type: none"> <input type="checkbox"/> To create user friendly features e.g. forms to enter new bookings <input type="checkbox"/> To create outputs e.g. report of bookings on a given date <input type="checkbox"/> To create interactive features e.g. buttons and menus <p>Query processor</p> <ul style="list-style-type: none"> <input type="checkbox"/> To create SQL/QBE queries <input type="checkbox"/> To search for data that meets set criteria, e.g. all bookings for next week <input type="checkbox"/> To perform calculations on extracted data, e.g. number of empty rooms tomorrow 	5															
3c	1 mark for at least two correct rows, 2 marks for all four correct rows <table border="1"> <thead> <tr> <th>Script</th><th>DDL</th><th>DML</th></tr> </thead> <tbody> <tr> <td>CREATE TABLE FILMS</td><td>✓</td><td></td></tr> <tr> <td>SELECT FilmID FROM FILMS</td><td></td><td>✓</td></tr> <tr> <td>ALTER TABLE FILMS ADD PRIMARY KEY (FilmID)</td><td>✓</td><td></td></tr> <tr> <td>CREATE DATABASE MYDATA</td><td>✓</td><td></td></tr> </tbody> </table>	Script	DDL	DML	CREATE TABLE FILMS	✓		SELECT FilmID FROM FILMS		✓	ALTER TABLE FILMS ADD PRIMARY KEY (FilmID)	✓		CREATE DATABASE MYDATA	✓		2
Script	DDL	DML															
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SELECT FilmID FROM FILMS		✓															
ALTER TABLE FILMS ADD PRIMARY KEY (FilmID)	✓																
CREATE DATABASE MYDATA	✓																

Answer 10

7(a)(i)	1 mark per bullet <ul style="list-style-type: none"> <input type="checkbox"/> <u>UserName</u> is the <u>primary key</u> in <u>USER</u> <input type="checkbox"/> <u>UserName</u> is (included as) a <u>foreign key</u> in <u>PHOTO</u> 	2
7(a)(ii)	1 mark for each correct relationship <div style="text-align: center;"> <pre> graph LR PHOTO -- "1:M" --> USER USER -- "1:M" --> TEXTPOST </pre> </div>	2

7(b)	1 mark per bullet to max 2 for explanation <ul style="list-style-type: none"> <input type="checkbox"/> Referential integrity is making sure tables do not try to reference data which does not exist // A value of one attribute of a table exists as a value of another attribute in a different table <input type="checkbox"/> A primary key cannot be deleted unless all dependent records are already deleted <input type="checkbox"/> Cascading delete <input type="checkbox"/> A primary key cannot be updated unless all dependent records are already updated <input type="checkbox"/> Cascading update / edit <input type="checkbox"/> Every foreign key value has a matching value in the corresponding primary key <input type="checkbox"/> The foreign keys must be the same data type as the corresponding primary key <p>1 mark for a suitable example e.g.</p> <ul style="list-style-type: none"> <input type="checkbox"/> A <u>UserName</u> cannot be deleted from the <u>USER</u> table if they have a related <u>photo/textpost</u> <input type="checkbox"/> If <u>UserName</u> is updated in <u>USER</u> table, it must also be updated in <u>PHOTO</u> and <u>TEXTPOST</u> tables <input type="checkbox"/> Cannot create/edit a record in <u>TEXTPOST</u> / <u>PHOTO</u> without a matching entry in <u>USER</u> table 	3
7(c)	Max 1 mark from each bulleted group <p>1NF</p> <ul style="list-style-type: none"> <input type="checkbox"/> No repeated groups of attributes <input type="checkbox"/> All attributes should be atomic <input type="checkbox"/> No duplicate rows <p>2NF (in 1NF and)</p> <ul style="list-style-type: none"> <input type="checkbox"/> No partial dependencies <p>3NF (in 2NF and)</p> <ul style="list-style-type: none"> <input type="checkbox"/> No non-key dependencies <input type="checkbox"/> No transitive dependencies 	3

7(b)	<p>1 mark per bullet to max 2 for explanation</p> <ul style="list-style-type: none"> <input type="checkbox"/> Referential integrity is making sure tables do not try to reference data which does not exist // A value of one attribute of a table exists as a value of another attribute in a different table <input type="checkbox"/> A primary key cannot be deleted unless all dependent records are already deleted <input type="checkbox"/> Cascading delete <input type="checkbox"/> A primary key cannot be updated unless all dependent records are already updated <input type="checkbox"/> Cascading update / edit <input type="checkbox"/> Every foreign key value has a matching value in the corresponding primary key <input type="checkbox"/> The foreign keys must be the same data type as the corresponding primary key <p>1 mark for a suitable example e.g.</p> <ul style="list-style-type: none"> <input type="checkbox"/> A UserName cannot be deleted from the USER table if they have a related photo/textpost <input type="checkbox"/> If UserName is updated in USER table, it must also be updated in PHOTO and TEXTPOST tables <input type="checkbox"/> Cannot create/edit a record in TEXTPOST / PHOTO without a matching entry in USER table 	3
7(c)	<p>Max 1 mark from each bulleted group</p> <p>1NF</p> <ul style="list-style-type: none"> <input type="checkbox"/> No repeated groups of attributes <input type="checkbox"/> All attributes should be atomic <input type="checkbox"/> No duplicate rows <p>2NF (in 1NF and)</p> <ul style="list-style-type: none"> <input type="checkbox"/> No partial dependencies <p>3NF (in 2NF and)</p> <ul style="list-style-type: none"> <input type="checkbox"/> No non-key dependencies <input type="checkbox"/> No transitive dependencies 	3

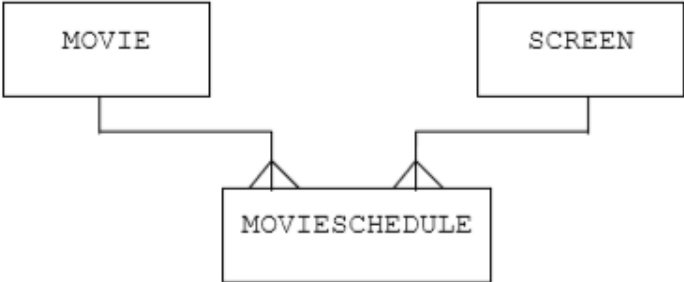
7(d)(i)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> <input type="checkbox"/> CREATE TABLE USER and (); <input type="checkbox"/> UserName, FirstName and SecondName as VARCHAR and commas <input type="checkbox"/> DateOfBirth as DATE and comma <input type="checkbox"/> PRIMARY KEY(UserName) <input type="checkbox"/> An appropriate NOT NULL <pre>CREATE TABLE USER(UserName: varchar(15) NOT NULL, FirstName: varchar(25), SecondName: varchar(25), DateOfBirth: Date, PRIMARY KEY(UserName));</pre>	5
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Question	Answer	Marks
7(d)(ii)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> <input type="checkbox"/> ALTER TABLE USER <input type="checkbox"/> ADD COUNTRY varchar; <pre>ALTER TABLE USER ADD Country varchar;</pre>	2

Answer 11

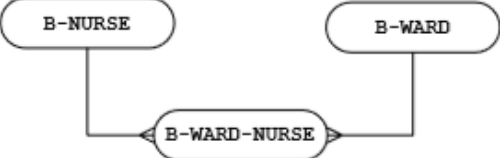
2(a)	1 mark for each correct relationship <div><div>LOGIN</div><div>PLAYER</div><div>PURCHASE</div></div>	2				
2(b)	1 mark for description <div><input type="checkbox"/> Ensure data is consistent / accurate // keep data consistent / accurate</div> 1 mark for example from: e.g. <div><input type="checkbox"/> Validation rules <input type="checkbox"/> Referential integrity <input type="checkbox"/> Verification <input type="checkbox"/> Input masks <input type="checkbox"/> Setting data types <input type="checkbox"/> Removing redundant data <input type="checkbox"/> Backup data <input type="checkbox"/> Access controls <input type="checkbox"/> Audit trail</div>	2				
2(c)	1 mark for the correct box ticked <table><tr><td>True</td><td>False</td></tr><tr><td>✓</td><td></td></tr></table> 1 mark per bullet for justification, max 2 <div><input type="checkbox"/> No repeated attributes // data is atomic // No partial dependencies (no dual keys) <input type="checkbox"/> No non-key / transitive dependencies</div>	True	False	✓		3
True	False					
✓						
2(d)(i)	1 mark per bullet <div><input type="checkbox"/> CREATE TABLE PLAYER and (); <input type="checkbox"/> PlayerID and PlayerName as VARCHAR and commas <input type="checkbox"/> SkillLevel as INT and comma <input type="checkbox"/> PRIMARY KEY(PlayerID) <input type="checkbox"/> An appropriate NOT NULL</div> <pre>CREATE TABLE PLAYER(PlayerID: varchar NOT NULL, PlayerName: varchar, SkillLevel: int, PRIMARY KEY(PlayerID),);</pre>	5				
2(d)(ii)	1 mark per bullet <div><input type="checkbox"/> ALTER TABLE PLAYER <input type="checkbox"/> ADD DateOfBirth Date;</div>	2				

Answer 12


7(a)	1 mark for each correct join 	2
7(b)	1 mark per bullet point <ul style="list-style-type: none"> <input type="checkbox"/> MovieID is the Primary Key in MOVIE <input type="checkbox"/> ... <u>links to</u> MovieID which is the Foreign Key in MOVIESCHEDULE <input type="checkbox"/> ScreenNumber is the Primary Key in SCREEN <input type="checkbox"/> ... <u>links to</u> ScreenNumber which is the Foreign Key in MOVIESCHEDULE 	4
7(c)	1 mark per bullet point <ul style="list-style-type: none"> <input type="checkbox"/> ALTER TABLE MOVIE <input type="checkbox"/> ADD (COLUMN) ProductionCompany VARCHAR(25); 	2
7(d)	1 mark per bullet point <p>Answer 1:</p> <ul style="list-style-type: none"> <input type="checkbox"/> SELECT Title, Rating <input type="checkbox"/> FROM MOVIE, MOVIESCHEDULE <input type="checkbox"/> WHERE MOVIE.MovieID = MOVIESCHEDULE.MovieID <input type="checkbox"/> AND MOVIESCHEDULE.ScreenNumber = 3; <p>Or</p> <p>Answer 2:</p> <ul style="list-style-type: none"> <input type="checkbox"/> SELECT Title, Rating <input type="checkbox"/> FROM MOVIE INNER JOIN MOVIESCHEDULE <input type="checkbox"/> ON MOVIE.MovieID = MOVIESCHEDULE.MovieID <input type="checkbox"/> WHERE MOVIESCHEDULE.ScreenNumber = 3; 	4

Answer 13

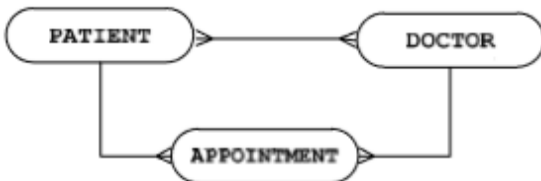
1(a)	Many-to-one	1
1(b)(i)	A-NURSE (<u>NurseID</u> , FirstName, FamilyName, WardName)	1
1(b)(ii)	<input type="checkbox"/> The primary key <u>WardName</u> in the A-WARD table ... <input type="checkbox"/> ... links to the foreign key <u>WardName</u> in the A-NURSE table.	<div>1</div> <div>1</div> 2
1(c)(i)	Many-to-many relationship	1
1(c)(ii)	B-WARD-NURSE (WardName, <u>NurseID</u>) Both attributes (with no additions) Joint primary key correctly underlined	<div>1</div> <div>1</div> 2

1(c)(iii)	 <p>Correct relationship between B-NURSE and B-WARD-NURSE</p> <p>Correct relationship between B-WARD and B-WARD-NURSE</p>	1 1	2
1(d)(i)	<pre>SELECT NurseID, FamilyName FROM B-NURSE WHERE Specialism = 'THEATRE';</pre>	1 1 1	3
1(d)(ii)	<pre>UPDATE B-NURSE SET FamilyName = 'Chi' WHERE NurseID = '076';</pre>	1 1 1	3

Answer 14

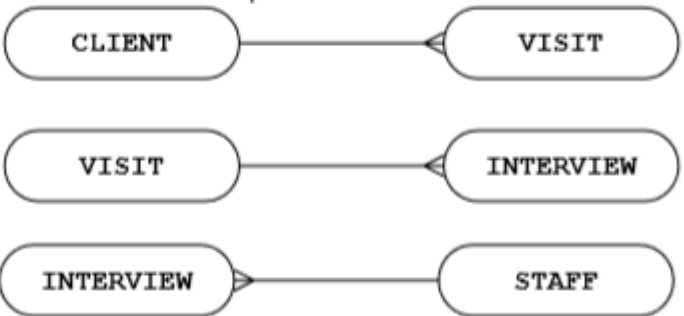
1(a)	Many-to-many relationship		1																
1(b)(i)	 <p>Both entities correctly labelled</p> <p>Correct relationship between SHOP and SHOP-SUPPLIER</p> <p>Correct relationship between SUPPLIER and SHOP-SUPPLIER</p>	1 1 1	3																
1(b)(ii)	<table border="1"> <thead> <tr> <th>Table</th><th>Primary key</th><th>Foreign keys(s) (if any)</th><th>Explanation</th></tr> </thead> <tbody> <tr> <td>SHOP</td><td>ShopID</td><td>None</td><td></td></tr> <tr> <td>SUPPLIER</td><td>SupplierID</td><td>None</td><td></td></tr> <tr> <td>SHOP-SUPPLIER</td><td>ShopID AND SupplierID</td><td>ShopID OR SupplierID (or both)</td><td>To create a link with the SHOP or SUPPLIER table.</td></tr> </tbody> </table> <p> <input type="checkbox"/> SHOP has primary key ShopID and SUPPLIER has primary key SupplierID <input type="checkbox"/> SHOP-SUPPLIER has primary key ShopID + SupplierID <input type="checkbox"/> Both SHOP and SUPPLIER show foreign key as 'None' <input type="checkbox"/> SHOP-SUPPLIER shows foreign key ShopID or SupplierID <input type="checkbox"/> Explanation for SHOP-SUPPLIER foreign key describes ShopID or SupplierID creating a link </p>	Table	Primary key	Foreign keys(s) (if any)	Explanation	SHOP	ShopID	None		SUPPLIER	SupplierID	None		SHOP-SUPPLIER	ShopID AND SupplierID	ShopID OR SupplierID (or both)	To create a link with the SHOP or SUPPLIER table.	1 1 1 1 1 1	5
Table	Primary key	Foreign keys(s) (if any)	Explanation																
SHOP	ShopID	None																	
SUPPLIER	SupplierID	None																	
SHOP-SUPPLIER	ShopID AND SupplierID	ShopID OR SupplierID (or both)	To create a link with the SHOP or SUPPLIER table.																
1(b)(iii)	<p>Two from:</p> <p><input type="checkbox"/> The database user will <u>frequently</u> want to search on contact name</p> <p><input type="checkbox"/> The contact name attribute has been indexed</p> <p><input type="checkbox"/> It allows for a <u>fast/faster</u> search using contact name</p>	1 1 1	Max 2																
1(c)(i)	<pre>SELECT ShopID, Location FROM SHOP WHERE RetailSpecialism = 'GROCERY';</pre>	1 1 1	3																
1(c)(ii)	<pre>INSERT INTO SHOP-SUPPLIER (ShopID, SupplierID) VALUES (8765, 'SUP89');</pre>	1 1 1	3																

Answer 15

7(a)(i)	$\left. \begin{array}{l} \underline{\text{PatientID}} \\ \underline{\text{DoctorID}} \end{array} \right\} (1)$ $\underline{\text{AppointmentDate, AppointmentTime}} (1)$	2
7(a)(ii)	 <p>One PATIENT attends many APPOINTMENTs One DOCTOR takes many APPOINTMENTs</p> <p>Special case for 1 mark only (only if no one to many relationships shown) Many PATIENTs are seen by many DOCTORs</p>	2

Question	Answer	Marks
7(b)	Two marks from: Either: <input type="checkbox"/> Add an attribute (for example Attended) <input type="checkbox"/> To the appointment table // APPOINTMENT Or: <input type="checkbox"/> Add an attribute (for example AppointmentsMissed) <input type="checkbox"/> To the patient table // PATIENT	2
7(c)(i)	Available to work at both SITE-A and SITE-B	1
7(c)(ii)	APPOINTMENT (Site, AppointmentDate, AppointmentTime, DoctorID, PatientID)	1
7(d)(i)	One mark per line UPDATE DOCTOR SET DoctorID = '017' WHERE DoctorID = '117';	3
7(d)(ii)	1 Mark per bullet, max 2 <input type="checkbox"/> Referential integrity should be maintained // Referential integrity could be violated. <input type="checkbox"/> Data becomes inconsistent <input type="checkbox"/> There may be records in the APPOINTMENT table showing doctor ID 117 <input type="checkbox"/> The APPOINTMENT table might not be automatically updated <input type="checkbox"/> Records in the APPOINTMENT table will become orphaned	Max 2
7(e)	One mark per line SELECT AppointmentDate, AppointmentTime FROM APPOINTMENT WHERE PatientID = '556';	3

Answer 16

7(a)(i)	<p>1 Mark for correct primary key identified in both STAFF and CLIENT STAFF(<u>StaffID</u>, StaffName, Department) CLIENT(<u>ClientName</u>, Address, Town)</p> <p>1 Mark for correct primary key identified in VISIT VISIT(<u>ClientName</u>, VisitDate)</p> <p>1 Mark for correct primary key identified in INTERVIEW INTERVIEW(<u>ClientName</u>, VisitDate, <u>StaffID</u>, SpecialistFocus, InterviewText)</p>	3
7(a)(ii)	<p>1 Mark for each correct relationship</p>  <pre> graph LR CLIENT --> VISIT VISIT --> INTERVIEW INTERVIEW --> STAFF </pre>	3
7(b)	<p>1 Mark for correct answer</p> <p>Add attribute VisitReportText to table <u>VISIT</u></p>	1
7(c)(i)	<p>1 Mark for each correct line</p> <pre> UPDATE CLIENT SET ClientName = 'Albright Holdings' WHERE ClientName = 'ABC Holdings'; </pre>	3
7(c)(ii)	<p>1 Mark per bullet, max 2</p> <ul style="list-style-type: none"> <input type="checkbox"/> Referential integrity should be maintained // Referential integrity could be violated <input type="checkbox"/> Data becomes inconsistent <input type="checkbox"/> There may be records in the VISIT and INTERVIEW tables / other tables with client name ABC Holdings <input type="checkbox"/> The ClientName in the VISIT and INTERVIEW tables / other tables might not be automatically updated <input type="checkbox"/> Records in the VISIT and INTERVIEW tables / other tables will become orphaned 	2

Question	Answer	Marks
7(d)	1 Mark for each correct line SELECT StaffID FROM INTERVIEW WHERE ClientName = 'New Age Toys' AND VisitDate = '13/10/2016'; (Accept clauses other way round)	3
7(e)	1 Mark for a correct answer Add a suitable attribute, for example, EuropeTraveller to the <u>STAFF</u> table // Add a suitable attribute, for example, Country to the <u>CLIENT</u> table	1

Answer 17

(a) (i) Database Management System

[1]

- (ii) **One mark** for identifying the way in which the data security is ensured, and **one mark** for a further description.

Maximum of two marks per method. **Maximum of two methods.**

[4]

- Issue usernames and passwords...
 - stops unauthorised access to the data
 - any further expansion e.g. strong passwords / passwords should be changed regularly etc...
- Access rights / privileges...
 - so that only relevant staff / certain usernames can read/edit certain parts of the data
 - can be read only, or full access / read, write and delete
 - any relevant example e.g. only class tutors can edit details of pupils in their tutor group
- Create (regular / scheduled) backups...
 - in case of loss/damage to the live data a copy is available
 - any relevant example e.g. backing up the attendance registers at the end of each day and storing the data off-site/to a separate device
- Encryption of data...
 - if there is unauthorised access to the data it cannot be understood // needs a decryption key
 - any relevant example e.g. personal details of pupils are encrypted before being sent over the Internet to examination boards
- Definition of different views...
 - composed of one or more tables
 - controls the scope of the data accessible to authorised users
 - any relevant example e.g. teachers can only see their classes
- Usage monitoring / logging of activity...
 - creation of an audit /activity log
 - records the use of the data in the database / records operations performed by all users / all access to the data
 - any relevant example, e.g. Track who changed a student's grade

(iii) Two points from:

[2]

- Set up search criteria
- To find / retrieve / return the data that matches the criteria
- Any relevant example e.g. find pupils who were absent on a particular day

(iv) Three points from:

[3]

- By storing data in (separate) linked tables data redundancy is reduced / data duplication is controlled...
- Compatibility / data integrity issues are reduced as data only needs to be updated once / is only stored once.
- Unwanted or accidental deletion of linked data is prevented as the DBMS will flag an error.
- Program - data dependence is overcome.
- Changes made to the structure of the data have little effect on existing programs.
- Ad-hoc / complex queries can be more easily made as the DBMS will have a query language/ QBE form.
- Unproductive maintenance is eliminated as changes only need to be made once (rather than changing multiple programs).
- Fields can be added or removed without any effect on existing programs (that do not use these fields).
- Security / privacy of the data is improved as each application only has access to the fields it needs.
- There is better control of data integrity as the DBMS (uses its Data Dictionary) to perform validation checks on data entered.

(b) (i) Two points from:

[2]

- The Primary Key in **CLASS** is ClassID
- The Foreign Key of **CLASS-GROUP** is ClassID.
- The Primary Key of **CLASS** is also included in **CLASS-GROUP** as a Foreign Key, (which links to **CLASS** table)

(ii) Many-to-one

[1]

(iii) One mark per statement. Several statements may be on the same line.

[4]

```
SELECT StudentID, FirstName
FROM STUDENT
WHERE TutorGroup = "10B" // WHERE (TutorGroup = "10B")
ORDER BY LastName ASC;
```



(iv) One mark per statement. Several statements may be on the same line.

[4]

```
SELECT STUDENT.LastName
FROM STUDENT, CLASS-GROUP
WHERE ClassID = "CS1" // WHERE (ClassID = "CS1")
AND CLASS-GROUP.StudentID = STUDENT.StudentID;
```

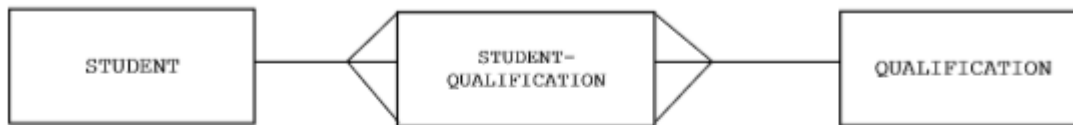
One mark per statement. Several statements may be on the same line.

```
SELECT STUDENT.LastName
FROM STUDENT INNER JOIN CLASS-GROUP
ON CLASS-GROUP.StudentID = STUDENT.StudentID
WHERE ClassID = "CS1" // WHERE (ClassID = "CS1");
```

Answer 18

(c) (i) One mark for each correct relationship.

[2]



(ii) One-to-many

[1]

(iii) Two points from:

[2]

- The primary key in the QUALIFICATION table is QualCode.
- The foreign key in the STUDENT-QUALIFICATION table is QualCode.
- The primary key of QUALIFICATION is also included in QualCode.

(d) (i) One mark per statement. Several statements may be on one line.

[2]

```

ALTER TABLE STUDENT
ADD DateOfBirth DATE;
  
```

(ii) One mark per statement. Several statements may be on one line.

[3]

```

SELECT StudentID, Grade, DateOfAward
FROM STUDENT-QUALIFICATION
WHERE QualCode = 'SC12';
  
```

(iii) One mark per statement. Several statements may be on one line.

[4]

```

SELECT STUDENT.FirstName, STUDENT.LastName, STUDENT-
    QUALIFICATION.QualCode
FROM STUDENT, STUDENT-QUALIFICATION
WHERE STUDENT-QUALIFICATION.Grade = 'A'
AND STUDENT.StudentID = STUDENT-QUALIFICATION.StudentID;
  
```

Alternative answer:

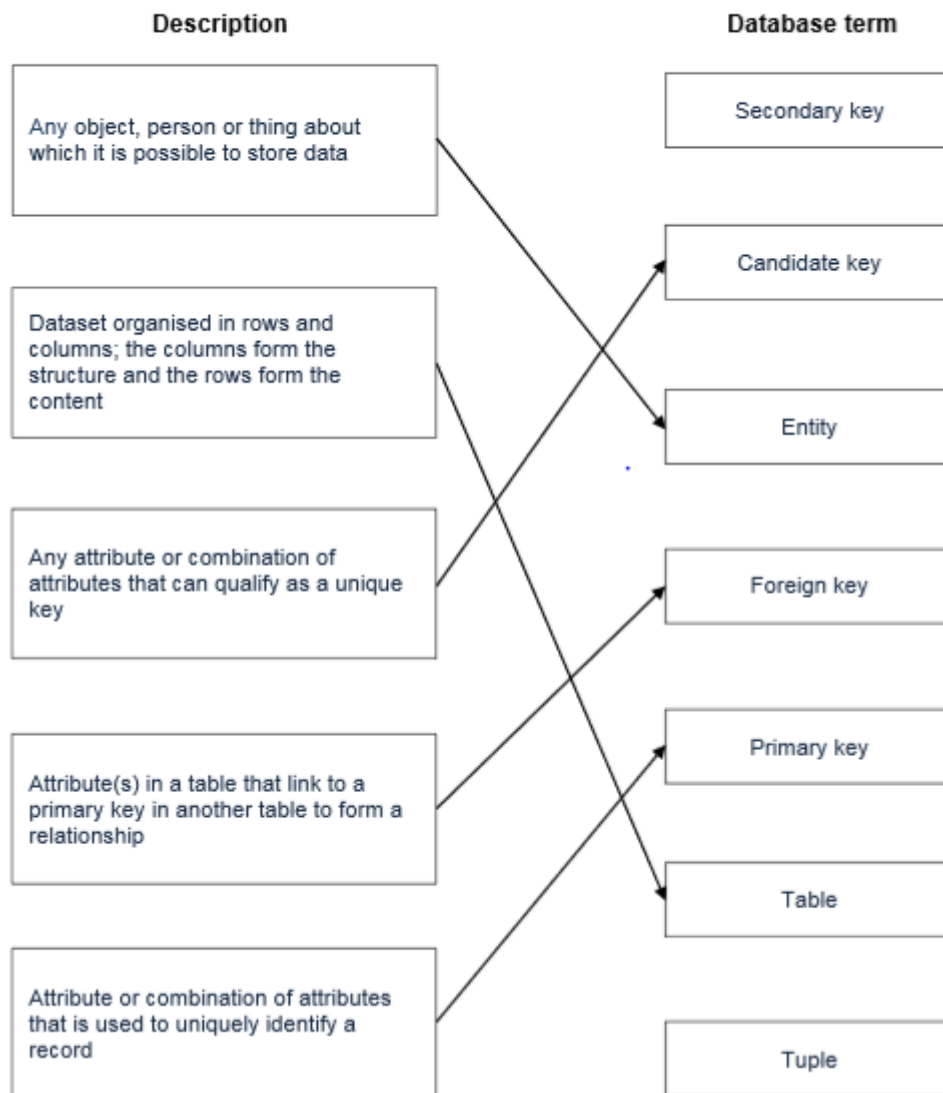
```

SELECT FirstName, LastName, STUDENT-QUALIFICATION.QualCode
FROM STUDENT, INNER JOIN STUDENT-QUALIFICATION
ON STUDENT.StudentID = STUDENT-QUALIFICATION.StudentID
WHERE Grade = 'A';
  
```

Answer 19

(a) One mark for each correct line.

Two lines from any box on left means no mark for that description.



(b) Any three from:

- Ensures related data in tables are consistent
- If one table has a foreign key (the 'foreign' table)...
- ... then it is not possible to add a record to that table / the 'foreign' table
- ... unless there is a corresponding record in the linked table with a corresponding primary key (the 'primary' table)
- Cascading delete
- If a record is deleted in the 'primary' table...
- all corresponding linked records in 'foreign' tables must also be deleted
- Cascading update
- If a record in the 'primary' table is modified...
- ... all linked records in foreign tables will also be modified

[3]

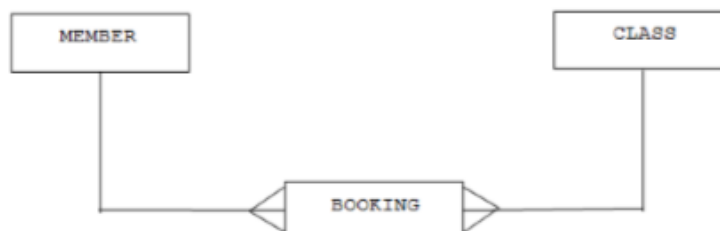
Answer 20

(a) **ONE** mark for each reason and **ONE** mark for a further explanation. **MAX THREE** reasons.

- Reduced data redundancy / data duplication
- Data is stored in (separate) linked tables
- The database (generally) stores data only once / data need only be updated once
- Improved data consistency / integrity / associated data will be automatically updated / easier to maintain the data / elimination of unproductive maintenance
- Complex queries can be more easily written
- To search / find specific data // specific example related to the Health Club
- Fields can be more easily added to or removed from tables
- Without affecting existing applications (that do not use these fields)
- Program-data dependence is overcome
- Changes to the data (design) do not require changes to programs // changes to programs do not require changes to data // the data can be accessed by any appropriate program
- Security is improved
- Each application only has access to the fields it needs // different users can be given different access rights
- Different users can be given different views of the data / data privacy is maintained
- So they do not see confidential information
- Allows concurrent access
- Record locking prevents two users updating the same record at the same time // record locking assures data consistency

[6]

(b) **ONE** mark for each correct relationship as shown.



[2]

(c) An example of a script is shown, but different syntax may be used.

```

CREATE TABLE CLASS (
    ClassID VARCHAR(5),
    Description VARCHAR(30),
    StartDate DATE,
    ClassTime TIME,
    NoOfSessions INT,
    AdultsOnly BIT,
    PRIMARY KEY(ClassID)
);
  
```

Mark as follows:

- 1 mark** for CREATE TABLE CLASS and ();
- 1 mark** for PRIMARY KEY(ClassID)
- 1 mark** for both ClassID VARCHAR(5), and Description VARCHAR(30),
- 1 mark** for both StartDate DATE, and ClassTime TIME,
- 1 mark** for NoOfSessions INT,
- 1 mark** for AdultsOnly BIT,

[6]

Answer 21

9 (a) Any one from:

- (ShopSales) table has repeated group (of attributes)
- each sales person has a number of products
- FirstName, Shop would need to be repeated for each record

(b) One mark for SalesPerson table

table: SalesPerson

FirstName	Shop
Nick	TX
Sean	BH
John	TX

table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacturer
Nick	television set	3	SKC
Nick	refrigerator	2	WP
Nick	digital camera	6	HKC
Sean	hair dryer	1	WG
Sean	electric shaver	8	BG
John	television set	2	SKC
John	mobile phone	8	ARC
John	digital camera	4	HKC
John	toaster	3	GK

(c) (i) Any **two** from:

- primary key of SalesPerson table is FirstName
- links to FirstName in SalesProducts table
- FirstName in SalesProductsS table is foreign key

[2]

(ii) • There is a non-key dependency

- Manufacturer is dependent on ProductName, (which is not the primary key of the SalesProducts table)

[2]

(iii) SalesPerson (FirstName, Shop)

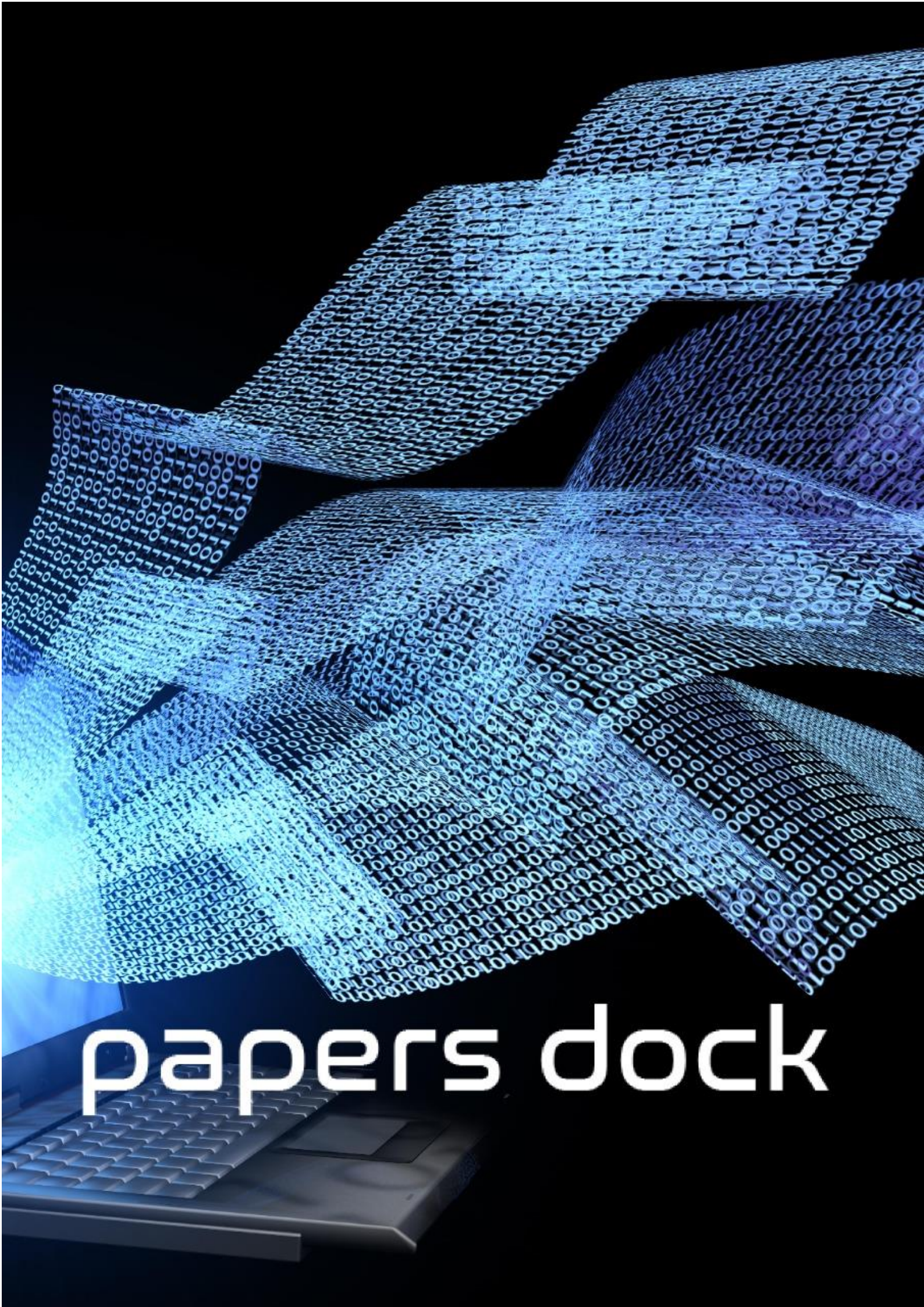
-SalesProducts (FirstName, ProductName, NoOfProducts) **OR**

SalesProducts (SalesID, FirstName, ProductName, NoOfProducts)

-Product (ProductName, Manufacturer)

1 mark for correct attributes in SalesProducts and Product tables and **1 mark** for correct identification of both primary keys

[2]



papers dock