Q1
6 Points

Provide appropriate definitions for the following:

Q1.1
1 Point

Entity cluster

> An entity type which is "virtual" and used to represent multiple entities and relationships in an Entity Relationship Diagram.

Q1.2
1 Point

Cardinality

> A property that assigns a specific value to connectivity and expresses the range of allowed entity occurrences associated with a single occurrence of the related entity.

Q1.3
1 Point

Domain

> Domain is a construct used to organize and describe an attribute's set of possible values.

Q1.4
1 Point

Unary relation

> An association within an entity itself.

Q1.5
1 Point

Non-key attribute

An attribute that is not part of a key.

Q1.6
1 Point

Derived attribute

An attribute in which it's values are derived or calculated via an algorithm.

Q2
8 Points

Typically, a company produces many products that belong to different categories such as food, cleaning, outdoor, etc. Because a company can produce many items, there is a 1:M relationship between COMPANY and PRODUCTS. Similarly, each category can list multiple products, creating a 1:M relationship between CATEGORY and PRODUCTS.

Q2.1
3 Points

Identify the business rules for this problem (Note: Business rules must be bidirectional).

A company may produce many products. Each product may be produced by a single company.

Each category may list multiple products. Each product may be listed in only one category.

Q2.2
5 Points

Create a Crow's Foot Entity Relational Diagram (ERD) that depicts a relational database model that captures these business rules.
(Note: Depict all the available information in your ERDs)

▾ Question 2_2.pdf   ⬇ Download

Q3
16 Points

Given the file structure shown in Figure 1, answer questions 3.1-3.5.

PROJ_NUM	PROJ_NAME	EMP_NUM	EMP_NAME	JOB_CODE	CHG_HOUR	PROJ_HOURS	EMP_PHONE
1	Hurricane	101	John D. Newton	EE	85.00	13.3	088-536-9271
1	Hurricane	105	David F. Schwann	CT	60.00	16.2	045-685-6537
1	Hurricane	110	Anne R. Ramoras	CT	60.00	14.3	047-896-8968
2	Coast	101	John D. Newton	EE	85.00	17.5	088-536-9271
2	Coast	108	June H. Sattelmeir	EE	85.00	16.3	056-324-1235
3	Satellite	110	Anne R. Ramoras	CT	62.00	18.2	047-896-8968
3	Satellite	105	David F. Schwann	CT	26.00	19.1	045-685-6537
3	Satellite	112	Allecia R. Smith	EE	87.0	12.6	098-342-0975

Figure 1: File Structure for Question 3

Q3.1
2 Points

Identify the various data sources for this file structure.

> 1.) Reports
> 2.) Forms

Q3.2
3 Points

Identify and discuss any one of the serious data redundancy problems exhibited by this file structure.

> There is repeated Employee data for each new project that a particular employee works with.

Q3.3
3 Points

What change would you recommend to address the redundancy problem identified in 3.2?

> I would recommend splitting the table into three separate tables where one would store all data pertinent to the employees, the second would store all data pertinent to the

projects and the third would contain data about the employee and the project they are assigned to. Each employee and project would be identified solely by their EMP_NUM and PROJ_NUM and linked to the first and second table by their EMP_NUM and PROJ_NUM

Q3.4
4 Points

Given your answer to Question 3.3, what new file structures (along with their attributes) would you create to eliminate the data redundancies?

Q3.5
4 Points

If the data redundancy identified in Question 3.2 was not fixed in Figure 1, describe any two anomalies that might arise? Explain with the help of examples.

Update Anomaly, this refers to updating the same data in multiple places. If John D. Newton changed his phone number, you'd have to update his number in 2 rows where he's assigned the coast and hurricane project.

Delete Anomaly, this refers to when a deletion causes unnecessary loss of data. If the Coast project was scrapped/cancelled, deleting that project from the table would mean losing information on the employee June H. Sattelmeir.

Q4
4 Points

With the help of appropriate examples, discuss the difference between a composite key and a composite attribute.

A composite key is two or more attributes which uniquely identify each record in a table such as the Email and Phone_number attribute in a table filled with customer data.

A composite attribute however is an attribute that can be further subdivided to yield more attributes. For example, A Customer_Name attribute containing someone's first and last name could be subdivided into two attributes First_Name and Last_name.

Q5
4 Points

What two courses of action are available to a database designer who encounters a multivalued attribute? Explain you answer with an example.

Q6
4 Points

A COURSE produces many CLASSes, and a CLASS belongs to one COURSE.
With the help of ERDs, show the two ways in which the relationship between COURSE and CLASS can be implemented. {Hint: Think about relationship strength}

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Q7
8 Points

You are given the database in Figure 2.

Table Name: EMPLOYEE

EMP_CODE	EMP_NAME	JOB_CODE
14	Rudell	2
15	McDade	1
16	Ruellardo	1
17	Smith	3
20	Smith	2

Table Name: BENEFIT

EMP_CODE	PLAN_CODE
15	2
15	3
16	1
17	1
17	3
17	4
20	3

Table Name: PLAN

PLAN_CODE	PLAN_DESCRIPTION
1	Term life
2	Stock purchases
3	Long-term disability
4	Dental

Table Name: JOB

JOB_CODE	JOB_DESCRIPTION
1	Clerical
2	Technical
3	Managerial

Figure 2: Database Structure

Use the information contained in this database to answer 7.1 and 7.2.

Q7.1
4 Points

A M:N relationship between two of the original tables has been broken down into two 1:M relationships for which one of the tables serves as a bridge entity. Identify all of the business rules that would reflect the relationships between all of the original tables in the database (before the bridge entity was created).

An employee may benefit from multiple plans. A plan may be benefitted from by multiple employees.

An employee may have many jobs. Each job may be possessed by one employee.

Q7.2
4 Points

Does BENEFIT table exhibit entity and referential integrity? Answer yes or no, and then explain your answer.

> Yes, because each PLAN_CODE or EMP_CODE in the table is a valid data value found in the PLAN and EMPLOYEE table respectively. Each foreign key value in the BENEFIT table exists in the tables to which they refer.

Q8
4 Points

What is a redundant relationship? Explain with an example. Give one advantage and one disadvantage of redundant relationships.

Q9
6 Points

What is time-variant data? With the help of an ERD, explain how would you handle such data from a database design point of view.

> time-variant data are values which change over time. I would keep a history of all the data changes within a new attribute. Like in a hospital, a patient may become assigned to new doctors more suitable for them over time, and so data about when they are newly assigned must be stored in another table as show in the attached ERD.

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Q10
12 Points

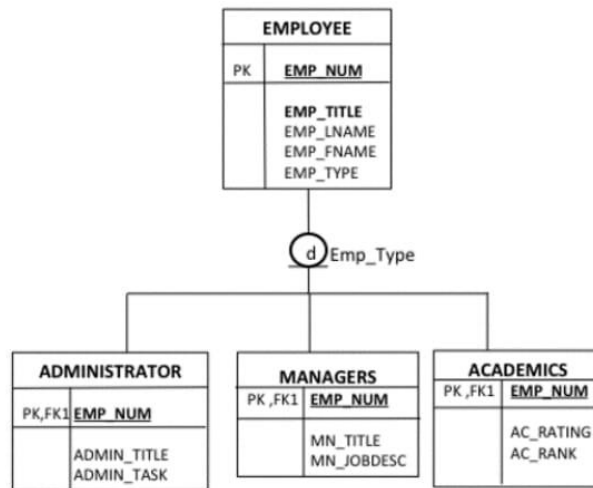Consider the specialization hierarchy given in Figure 3:

Figure 3: Specialization Hierarchy

Q10.1
4 Points

Identify the subtype discriminator. What values would you assign to the subtype discriminator to differentiate between the subtypes?

> Emp_Type is the subtype discriminator.

Q10.2
4 Points

According to the data model, is it required that every entity instance in the EMPLOYEE table be associated with an entity instance in all of the subtypes? Why, or why not?

> No, because as indicated by the circle with the d written within, this model has a Disjoint constraint which depicts that every entity instance of the EMPLOYEE table can only be associated with an entity instance in just ONE of the subtypes.

Q10.3
4 Points

According to the data model, is it possible to have an entity instance in EMPLOYEE, without it appearing in any of the subtypes? Justify your answer.

> Yes, because as indicated by the single line under the circle, this model has a partial constraint which depicts that an entity instance in EMPLOYEE does not have to appear in any of the subtypes.

Q11
4 Points

A table with two attributes, where one of them is a primary key, potentially exhibits 3NF characteristics. Explain why thus is the case and justify your answer with an example.

> So long as the non-key attribute would depend on this primary key attribute, there wouldn't be an partial or transitive dependencies, a primary key is chosen and there wouldn't be any repeating groups. This would mean the table is in 2NF and has no transitive dependencies and would exhibit 3NF characteristics if it isn't already 3NF anyway.

Q12
10 Points

The dependency diagram in Figure 4 indicated that authors are paid royalties for each book they write for a publisher. The amount of the royalty can vary by author, by book, and by edition of the book.
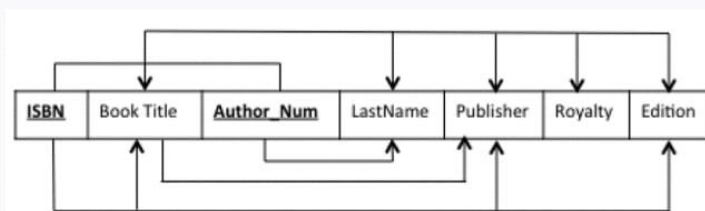
Figure 4: Dependency Diagram

Q12.1
5 Points

Use the dependency diagram in Figure 4 to create 2NF level dependency diagram.

▾ Q12.pdf   ⬇ Download

Q12.2
5 Points

Use the dependency diagrams from 12.1 to create 3NF level dependency diagram.

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Q13
4 Points

What is a surrogate key? Discuss clearly two situations in which you would use a surrogate key.

> A system-assigned primary key, generally numeric and auto-incremented. I would use it when my selected candidate key is too cumbersome or when it has embedded semantic contents.

DBF Final Exam

● UNGRADED

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TOTAL POINTS
- / 90 pts

QUESTION 1

(no title)	6 pts
1.1 — (no title)	1 pt
1.2 — (no title)	1 pt
1.3 — (no title)	1 pt
1.4 — (no title)	1 pt
1.5 — (no title)	1 pt
1.6 — (no title)	1 pt

QUESTION 2

(no title)	8 pts
2.1 — (no title)	3 pts
2.2 — (no title)	5 pts

QUESTION 3

(no title)	16 pts
3.1 — (no title)	2 pts
3.2 — (no title)	3 pts
3.3 — (no title)	3 pts

3.4	(no title)	4 pts
3.5	(no title)	4 pts

QUESTION 4
(no title) 4 pts

QUESTION 5
(no title) 4 pts

QUESTION 6
(no title) 4 pts

QUESTION 7
(no title) 8 pts

7.1	(no title)	4 pts
7.2	(no title)	4 pts

QUESTION 8
(no title) 4 pts

QUESTION 9
(no title) 6 pts

QUESTION 10
(no title) 12 pts

10.1	(no title)	4 pts
10.2	(no title)	4 pts
10.3	(no title)	4 pts

QUESTION 11
(no title) 4 pts

QUESTION 12
(no title) 10 pts

12.1	(no title)	5 pts
12.2	(no title)	5 pts

QUESTION 13
(no title) 4 pts