



“Investing in Africa’s future”
COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

NCIS301: DATABASE CONCEPTS

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2022

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TIME:3 HOURS

Answer questions as specified in each section.
Total possible mark is **100**.

Start **each Section B question** on a new page in your answer booklet.

The marks allocated to **each** question are shown at the end of the section.

Avoid zero-intelligible content and answer in expanded bullet point form.

Credit will be awarded for logical, systematic and neat presentations.

SECTION A – ANSWER ALL QUESTIONS

1. What are the potential benefits of implementing a database system? [5 Marks]
2. What are the potential costs of implementing a database system? [5 marks]
3. What are homonyms and synonyms, and why should they be avoided in database design? [5 Marks]
4. What are the main operations of relational algebra? [5 Marks]
5. Explain the difference between the natural join and outer join? [2 Marks]
6. Explain the difference between the right outer join and the left outer join?. [3 Marks]
7. What two conditions must be met before an entity can be classified as a weak entity? Give an example of a weak entity [3 Marks]
8. What is a composite entity, and when is it used? [2 Marks]
9. What is a partial dependency? With what normal form is it associated? Demonstrate in diagram form? [3 Marks]
10. What is a transitive dependency? With what normal form is it associated? Demonstrate in diagram form? [3 Marks]
11. What three (often conflicting) database requirements must be addressed in database design? [4 Marks]

SECTION B - ANSWER ANY TWO QUESTIONS

Question 1 : SQL (30 Marks)

1. Write the SQL code that will create the table structure for a table named EMP_1. The basic EMP_1 table structure is summarized in Table Q8.1. (Note that the JOB_CODE is the FK to JOB.)

Table Q7.1 The EMP_1 Table Structure

ATTRIBUTE (FIELD) NAME	DATA DECLARATION
EMP_NUM	CHAR(3)
EMP_LNAME	VARCHAR(15)
EMP_FNAME	VARCHAR(15)
EMP_INITIAL	CHAR(1)
EMP_HIREDATE	DATE
JOB_CODE	CHAR(3)

2. Having created the table structure in Question 1, write the SQL code to enter the first two rows for the table shown in Figure Q8.2.

FIGURE Q8.2 The Contents of the EMP_1 Table

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE
101	News	John	G	08-Nov-00	502
102	Senior	David	H	12-Jul-89	501
103	Arbough	June	E	01-Dec-96	500
104	Ramoras	Anne	K	15-Nov-87	501
105	Johnson	Alice	K	01-Feb-93	502
106	Smithfield	William		22-Jun-04	500

107	Alonzo	Maria	D	10-Oct-93	500
108	Washington	Ralph	B	22-Aug-91	501
109	Smith	Larry	W	18-Jul-97	501

- Assuming that the data shown in the EMP_1 table have been entered, write the SQL code that will list all attributes for a job code of 502.
- Write the SQL code that will save the changes made to the EMP_1 table.
- Write the SQL code to change the job code to 501 for the person whose personnel number is 107. After you have completed the task, examine the results, and then reset the job code to its original value.

Question 2: Normalization (30 Marks)

- Using the INVOICE table structure shown in Table P7.1, write the relational schema, draw its dependency diagram and identify all dependencies (including all partial and transitive dependencies). You can assume that the table does not contain repeating groups and that any invoice number may reference more than one product. (*Hint: This table uses a composite primary key.*)

Table P7.1 Sample INVOICE Records

Attribute Name	Sample Value	Sample Value	Sample Value	Sample Value	Sample Value
INV_NUM	211347	211347	211347	211348	211349
PROD_NUM	AA-E3422QW	QD-300932X	RU-995748G	AA-E3422QW	GH-778345P
SALE_DATE	15-Jan-2006	15-Jan-2006	15-Jan-2006	15-Jan-2006	16-Jan-2006
PROD_LABEL	Rotary sander	0.25-cm. drill bit	Band saw	Rotary sander	Power drill
VEND_CODE	211	211	309	211	157
VEND_NAME	NeverFail, Inc.	NeverFail, Inc.	BeGood, Inc.	NeverFail, Inc.	ToughGo, Inc.
QUANT_SOLD	1	8	1	2	1
PROD_PRICE	€34.46	€2.73	€31.59	€34.46	€69.32

- Using the table structures you created in Problem 2, remove all transitive dependencies, and draw the new dependency diagrams. Also identify the normal forms for each table structure you created.
- Using the results of Problem 3, draw the ERD using UML notation.

Question 3: Relational Database Model (30 Marks)

Use the database shown in Figure P3.7 to answer Problems 7-13.

FIGURE P3.7 The Ch03_StoreCo Database Tables

Database name: Ch03_StoreCo

Table name: EMPLOYEE

EMP_CODE	EMP_TITLE	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_DOB	STORE_CODE
1	Mr.	Williamson	John	W	21-May-64	3
2	Ms.	Ratula	Nancy		09-Feb-69	2

3	Ms.	Greenboro	Lottie	R	02-Oct-61	4
4	Mrs.	Rumpersfro	Jennie	S	01-Jun-71	5
5	Mr.	Smith	Robert	L	23-Nov-59	3
6	Mr.	Renselaer	Cary	A	25-Dec-65	1
7	Mr.	Ogallio	Roberto	S	31-Jul-62	3
8	Ms.	Johnsson	Elizabeth	I	10-Sep-68	1
9	Mr.	Eindsmar	Jack	W	19-Apr-55	2
10	Mrs.	Jones	Rose	R	06-Mar-66	4
11	Mr.	Broderick	Tom		21-Oct-72	3
12	Mr.	Washington	Alan	Y	08-Sep-74	2
13	Mr.	Smith	Peter	N	25-Aug-64	3
14	Ms.	Smith	Sherry	H	25-May-66	4
15	Mr.	Olenko	Howard	U	24-May-64	5
16	Mr.	Archialo	Barry	V	03-Sep-60	5
17	Ms.	Grimaldo	Jeanine	K	12-Nov-70	4
18	Mr.	Rosenberg	Andrew	D	24-Jan-71	4
19	Mr.	Rosten	Peter	F	03-Oct-68	4
20	Mr.	Mckee	Robert	S	06-Mar-70	1
21	Ms.	Baumann	Jennifer	A	11-Dec-74	3

Table name: STORE

STORE_CODE	STORE_NAME	STORE_YTD_SALES	REGION_CODE	EMP_CODE
1	Access Junction	€792,730.05	2	8
2	Database Corner	€1,123,370.04	2	12
3	Tuple Charge	€779,558.74	1	7
4	Attribute Alley	€746,209.16	2	3
5	Primary Key Point	€2,314,777.78	1	15

Table name: REGION

REGION_CODE	REGION_DESCRIPT
1	East
2	West

- For each table, identify the primary key and the foreign key(s). If a table does not have a foreign key, write *None* in the space provided.

TABLE	PRIMARY KEY	FOREIGN KEY(S)
EMPLOYEE		
STORE		
REGION		

- Do the tables exhibit entity integrity? Answer yes or no; then explain your answer.

TABLE	ENTITY INTEGRITY	EXPLANATION
EMPLOYEE		
STORE		
REGION		

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3. Do the tables exhibit referential integrity? Answer yes or no; then explain your answer. Write *NA* (Not Applicable) if the table does not have a foreign key.

TABLE	REFERENTIAL INTEGRITY	EXPLANATION
EMPLOYEE		
STORE		
REGION		

4. Describe the type(s) of relationship(s) between STORE and REGION.
5. Create the ERD using UML notation to show the relationship between STORE and REGION.
6. Describe the type(s) of relationship(s) between EMPLOYEE and STORE. (*Hint*: Each store employs many employees, one of whom manages the store.) Draw the ERD to show the relationships among EMPLOYEE, STORE, and REGION.

END OF PAPER
