University College London

Department of Information Studies

MSc Information Science

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Module Code and Title: INST0012 Database Theory and Practise

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Assignment: Assessed Exercise 2

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1. MAPPINGS FROM CONCEPTUAL TO LOGICAL RELATIONAL REPRESENTATION:

1.1 MAPPINGS TO THE LOGICAL DATA MODEL

EXAMINER(Employee-ID, Name, *Centre*)

>*Centre*: foreign key refers to Location in relation Examination Centre: NULL not allowed

EXAM_OPPORTUNITY(ID, Date, *Tried-By*, *Assignee*, *Route*)

>*Tried-By*: foreign key refers to SSN in relation Driving License Exam Applicant: NULL not allowed

>*Assignee*: foreign key refers to Employee-ID in relation Examiner: NULL not allowed

>*Rout*e: foreign key refers to Route-ID in relation Exam Driving Route: NULL not allowed

DRIVING_LICENSE_EXAM_APPLICANT(SSN, Name, *Taught-By*)

>*Taught-By*: foreign key refers to SSN in relation Driving Instructor: NULL not allowed

EXAMINATION_CENTRE(Location)

EXAM_DRIVING_ROUTE(Route-ID, Possible-In-Winter, *Centre*)

>*Centre*: foreign key refers to Location in relation Examination Centre: NULL not allowed

DRIVING_INSTRUCTOR(SSN, Name)

CAR(Registration, Brand, Year-Of-Purchase, *Company*)

>*Company*: foreign key refers to VAT Number in relation Driving School Company: NULL not allowed

DRIVING_SCHOOL_COMPANY(VAT-Number, Name)

TRAINED_OFFICIAL_DRIVING_INSTRUCTOR_DI(*TODI-DI-SSN*, Years-Instructed, *Company*)

>*TODI-DI-SSN*: foreign key refers to SSN in relation Driving Instructor: NULL not allowed

>*Company*: foreign key refers to VAT Number in relation Driving School Company: NULL not allowed

FAMILY_MEMBER_DI (*FM-DI-SSN*)

>*FM-DI-SSN*: foreign key refers to SSN in relation Driving Instructor: NULL not allowed

IS_TAUGHT_BY(*DLEA-SSN*, *DI-SSN*)

>*DLEA-SSN*: foreign key refers to SSN in relation Driving License Exam Applicant: NULL not allowed

>*DI-SSN*: foreign key refers to SSN in relation Driving Instructor: NULL not allowed

1.2 INFORMATION ON LOSS OF SEMANTICS DUE TO MAPPING

- The overlap specialisation of *Driving_Instructor* into *Trained_Official_Driving_ Instructor* and *Family_member* cannot be enforced. There is no attribute in the parent table which can enforce this. This has to be checked in the application layer (data entry layer).
- The minimum cardinality of 1 in the relationship type *Taught_By* between *Driving_License_*

Exam_Applicant and *Driving_Instructor* cannot be enforced. The reason for this is because there is no attribute or route to enforce this. Therefore, this will have to be checked in the application layer (data entry layer).

- The minimum cardinality of 2 in the relationship type *Driving_License_Exam_Applicant* and *Driving_Instructor* cannot be enforced. The reason for this is because there is no attribute or route to enforce this. Therefore, this will have to be checked in the application layer (data entry layer).

1.3 NOTES

- The green-coloured attributes are the attributes I have added which are not from the scenario

2. DATABASE

2.1 OVERALL DATABASE STRUCTURE

	Table	Action	Rows	Type	Collation	Size	Overhead
☐	CAR	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	4	InnoDB	utf8_general_ci	32.0 KiB	-
☐	DRIVING_INSTRUCTOR	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	16.0 KiB	-
☐	DRIVING_LICENSE_EXAM_APPLICANT	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	32.0 KiB	-
☐	DRIVING_SCHOOL_COMPANY	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	3	InnoDB	utf8_general_ci	16.0 KiB	-
☐	EXAMINATION_CENTRE	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	16.0 KiB	-
☐	EXAMINER	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	32.0 KiB	-
☐	EXAM_DRIVING_ROUTE	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	32.0 KiB	-
☐	EXAM_OPPORTUNITY	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	64.0 KiB	-
☐	FAMILY_MEMBER_DI	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	2	InnoDB	utf8_general_ci	16.0 KiB	-
☐	IS_TAUGHT_BY	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	5	InnoDB	utf8_general_ci	32.0 KiB	-
☐	TRAINED_OFFICIAL_DRIVING_INSTRUCTOR_DI	🔲 Browse 📈 Structure 🔍 Search 🏗 Insert 🗑 Empty ⛔ Drop	3	InnoDB	utf8_general_ci	32.0 KiB	-
	11 tables	Sum	47	InnoDB	utf8_general_ci	320.0 KiB	0 B

2.2 CAR

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	REGISTRATION	char(7)	utf8_general_ci		No	None		🖊 Change ⛔ Drop More ▼
☐	2	BRAND	varchar(30)	utf8_general_ci		No	None		🖊 Change ⛔ Drop More ▼
☐	3	YEAR_OF_PURCHASE	year(4)			No	None		🖊 Change ⛔ Drop More ▼
☐	4	COMPANY	char(6)	utf8_general_ci		No	None		🖊 Change ⛔ Drop More ▼

🔲 Browse 📈 Structure 🔲 SQL 🔍 Search 🏗 Insert 📤 Export 📥 Import 🔧 Operations

Relations

Column	Foreign key constraint (INNODB)		
REGISTRATION			
BRAND	No index defined!		
YEAR_OF_PURCHASE	No index defined!		
COMPANY	`uczcsa1_test`.`DRIVING_SCHOOL_COMPANY`.`VAT_NUMBER`	ON DELETE CASCADE	ON UPDATE CASCADE

2.3 DRIVING INSTRUCTOR

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	SSN	char(6)	utf8_general_ci		No	None		🖊 Change ⛔ Drop More ▼
☐	2	NAME	varchar(30)	utf8_general_ci		No	None		🖊 Change ⛔ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)
SSN	
NAME	No index defined!

2.4 DRIVING_LICENSE_EXAM_APPLICANT

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	**SSN**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼
☐	2	**NAME**	varchar(30)	utf8_general_ci		No	None		Change ⊝ Drop More ▼
☐	3	**TAUGHT_BY**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼

↑ Check All / Uncheck All With selected: 🔲 Browse 🖊 Change ⊝ Drop 🔑 Primary 🆄 Unique 📑 Index

🔲 Browse | 🗏 Structure | 🗒 SQL | 🔍 Search | 📝 Insert | 📤 Export | 📥 Import | 🔧 Operations

Relations

Column	Foreign key constraint (INNODB)				
SSN		⌄			
NAME	No index defined!				
TAUGHT_BY	`uczcsa1_test`.`DRIVING_INSTRUCTOR`.`SSN`	⌄	ON DELETE CASCADE ⌄	ON UPDATE CASCADE ⌄	

2.5 DRIVING_SCHOOL_COMPANY

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	**VAT_NUMBER**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼
☐	2	**NAME**	varchar(30)	utf8_general_ci		No	None		Change ⊝ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)	
VAT_NUMBER		⌄
NAME	No index defined!	

2.6 EXAMINATION_CENTRE

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	**LOCATION**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)	
LOCATION		⌄

2.7 EXAMINER

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	**EMPLOYEE_ID**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼
☐	2	**NAME**	varchar(60)	utf8_general_ci		No	None		Change ⊝ Drop More ▼
☐	3	**CENTRE**	char(6)	utf8_general_ci		No	None		Change ⊝ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)				
EMPLOYEE_ID					
NAME	No index defined!				
CENTRE	`uczcsa1_test`.`EXAMINATION_CENTRE`.`LOCATION`		ON DELETE	CASCADE	ON UPDATE	CASCADE

2.8 EXAM_DRIVING_ROUTE

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	ROUTE_ID	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼
☐	2	POSSIBLE_IN_WINTER	tinyint(1)			No	None		Change ● Drop More ▼
☐	3	CENTRE	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼

Relations

Column	Foreign key constraint (INNODB)				
ROUTE_ID					
POSSIBLE_IN_WINTER	No index defined!				
CENTRE	`uczcsa1_test`.`EXAMINATION_CENTRE`.`LOCATION`		ON DELETE CASCADE	ON UPDATE CASCADE	

2.9 EXAM_OPPORTUNITY

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	ID	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼
☐	2	DATE	date			No	None		Change ● Drop More ▼
☐	3	TRIED_BY	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼
☐	4	ASSIGNEE	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼
☐	5	ROUTE	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼

Relations

Column	Foreign key constraint (INNODB)				
ID					
DATE	No index defined!				
TRIED_BY	`uczcsa1_test`.`DRIVING_LICENSE_EXAM_APPLICANT`.`SSN`		ON DELETE CASCADE	ON UPDATE CASCADE	
ASSIGNEE	`uczcsa1_test`.`EXAMINER`.`EMPLOYEE_ID`		ON DELETE CASCADE	ON UPDATE CASCADE	
ROUTE	`uczcsa1_test`.`EXAM_DRIVING_ROUTE`.`ROUTE_ID`		ON DELETE CASCADE	ON UPDATE CASCADE	

2.10 FAMILY_MEMBER_DI

	#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
☐	1	FM_DI_SSN	char(6)	utf8_general_ci		No	None		Change ● Drop More ▼

Relations

Column	Foreign key constraint (INNODB)				
FM_DI_SSN	`uczcsa1_test`.`DRIVING_INSTRUCTOR`.`SSN`		ON DELETE CASCADE	ON UPDATE CASCADE	

2.11 IS_TAUGHT_BY

#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
1	**DI_SSN**	char(6)	utf8_general_ci		No	*None*		🖉 Change ⊖ Drop More ▼
2	**DLEA_SSN**	char(6)	utf8_general_ci		No	*None*		🖉 Change ⊖ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)			
DI_SSN	`uczcsa1_test`.`DRIVING_INSTRUCTOR`.`SSN`	ON DELETE CASCADE ∨	ON UPDATE CASCADE ∨
DLEA_SSN	`uczcsa1_test`.`DRIVING_LICENSE_EXAM_APPLICANT`.`SSN`	ON DELETE CASCADE ∨	ON UPDATE CASCADE ∨

This table has been created as a new relation between Binary (N:M) relationship entities: *Driving License Exam Applicant and Driving Instructor*. The primary key of *IS_TAUGHT_BY* is a combination of foreign keys referring to the primary keys of the relations corresponding to the participating entity types.

2.12 TRAINED_OFFICIAL_DRIVING_INSTRUCTOR_DI

#	Column	Type	Collation	Attributes	Null	Default	Extra	Action
1	**TODI_DI_SSN**	char(6)	utf8_general_ci		No	*None*		🖉 Change ⊖ Drop More ▼
2	**YEARS_INSTRUCTED**	smallint(60)			No	*None*		🖉 Change ⊖ Drop More ▼
3	**COMPANY**	char(6)	utf8_general_ci		No	*None*		🖉 Change ⊖ Drop More ▼

Relations

Column	Foreign key constraint (INNODB)			
TODI_DI_SSN	`uczcsa1_test`.`DRIVING_INSTRUCTOR`.`SSN`	ON DELETE CASCADE ∨	ON UPDATE CASCADE ∨
YEARS_INSTRUCTED	No index defined!		
COMPANY	`uczcsa1_test`.`DRIVING_SCHOOL_COMPANY`.`VAT_NUMBER`	ON DELETE CASCADE ∨	ON UPDATE CASCADE ∨

2.13 NOTES

- MySQL automatically converts boolean data types (the attribute *Possible_In_Winter* from *Exam_Driving_Route*) into *tinyint* data types. The 0 represents *FALSE* and 1 represents *TRUE*

3. SQL QUERIES

QUERY 1

An SQL Update statement using WHERE

This query updates the brand of the car whose registration is 'ZX36KLY', from 'LAMBORGHINI' to 'NISSAN'

UPDATE CAR SET BRAND = 'NISSAN' WHERE REGISTRATION = 'ZX36KLY'

QUERY 2

An outer join SQL query

Performs a right outer join between the 'CAR' and 'DRIVING_SCHOOL_COMPANY' on the COMPANY (VAT_NUMBER) column.

Showing rows 0 - 3 (4 total, Query took 0.0002 sec)

```
SELECT *
FROM CAR
RIGHT OUTER JOIN DRIVING_SCHOOL_COMPANY ON CAR.COMPANY = DRIVING_SCHOOL_COMPANY.VAT_NUMBER
LIMIT 0 , 30
```

☐ Profiling [Inline] [Edit] [Explain SQL

Show : 30 row(s) starting from row # 0 in horizontal ∨ mode and repeat headers after 100

+ Options

REGISTRATION	BRAND	YEAR_OF_PURCHASE	COMPANY	VAT_NUMBER	NAME
LH47EXB	TOYOTA	2015	000003	000003	A PLUS DRIVING TUTORS
SR54UVZ	BMW	2018	000001	000001	AKPINAR DRIVING SCHOOL
TF93YDK	MERCEDES	2019	000002	000002	FIRST PASS DRIVING SCHOOL
ZX36KLY	NISSAN	2020	000001	000001	AKPINAR DRIVING SCHOOL

QUERY 3

A correlated SQL query with NOT EXISTS

Returns all the 'EXAMINER' IDs and Names who have not been assigned to an 'EXAM OPPORTUNITY' (examiners who have not been assigned to any exams). 'AS' has been used to change the column names accordingly. 'ORDER BY' and 'ASC' have been used to order the results by ascending 'EMPLOYEE_ID'. (Note: *Inline* option on the query has been selected to ensure the whole query can be viewed).

Showing rows 0 - 1 (2 total, Query took 0.0002 sec)

```
SELECT EX.EMPLOYEE_ID AS EmployeeID, EX.NAME AS ExaminerName
  FROM EXAMINER EX
    WHERE NOT EXISTS
      (SELECT *
        FROM EXAM_OPPORTUNITY EXO
          WHERE EX.EMPLOYEE_ID = EXO.ASSIGNEE)
            ORDER BY EmployeeID ASC;
```

Show : 30 row(s) starting from row # 0 in horizontal

Sort by key: None ∨

+ Options

	EmployeeID	ExaminerName
☐ 🖉 Edit 🖉 Inline Edit ⧉ Copy ⊖ Delete	000004	Oliver Duke-Williams
☐ 🖉 Edit 🖉 Inline Edit ⧉ Copy ⊖ Delete	000005	Antonis Bikakis