Adam Ali

April 8, 2018

HW1

CSS 475 A Database Systems

Homework 1 (20 possible points) [4% of final grade]

DUE BY: APRIL 8 (SUNDAY) 11:59:59 PM

1. (3 points) Identify at least 2 informal queries and 2 update operations that you would expect to apply to the database shown in Figure 1. (e.g. an example query can be: List the name of the student whose Student_number is 17; an example update can be: Insert a new course in the database whose Course_name = Algorithm, Course_number = CS4300, Credit_hours = 4, Department = CS. These 2 examples CANNOT be used as your answers)

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	07	King
92	CS1310	Fall	07	Anderson
102	CS3320	Spring	08	Knuth
112	MATH2410	Fall	08	Chang
119	CS1310	Fall	08	Anderson
135	CS3380	Fall	08	Stone

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

PREREQUISITE

Course_number	Prerequisite_number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310

Figure 1. Example database (from the textbook: *Fundamentals of Database Systems,* by R. Elmasri & S. B. Navathe, Pearson.)

Informal queries: **1.** List Course_number from SECTION where Instructor='Anderson'

2. List Course_name from COURSE where Department='CS'

Informal updates: **1.** Insert new PREREQUISITE where Course_number='CSS343' and Prerequisite_number='CSS342'

2. Insert new GRADE_REPORT where Student_number=20, Section_id=200 and Grade='A'

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2. (3 points) Name all the relationships among the records of the database shown in Figure 1 (e.g., each SECTION record is related to a COURSE record. This example can be included in your answer).

Each PREREQUISITE is related to a COURSE.

Each GRADE_REPORT is related to a STUDENT.

Each GRADE_REPORT is related to a SECTION.

Each SECTION is related to a COURSE.

3. (3 points) Cite at least 5 examples of integrity constraints that you think should hold on the database shown in Figure 1. The 5 examples of integrity constraints you pick should at least belong to 2 (and **preferably 3**) categories as discussed in class.

1. **[DOMAIN]** Every GRADE_REPORT record must use a character A – F for value Grade.
2. **[DOMAIN]** Every Course_number value in COURSE, SECTION and PREREQUISITE must have a Department prefix. *Note: perhaps we can make Department part of the primary key and simplify Course_number to no prefix.
3. **[REFERENTIAL]** Every GRADE_REPORT record must be related to a SECTION record. That is, every Section_id in a GRADE_REPORT record must match a Section_id in SECTION. *Note: this is only one way, in that GRADE_REPORT requires a SECTION but not every SECTION needs an associated GRADE_REPORT necessarily.
4. **[REFERENTIAL]** Every GRADE_REPORT record must be related to a STUDENT record. That is, every Student_id in a GRADE_REPORT record must match a Student_id in STUDENT. *Note: this is also only one way, in that every GRADE_REPORT needs a STUDENT but not every STUDENT needs an associate GRADE_REPORT necessarily.
5. **[KEY / UNIQUENESS]** Every SECTION must have a unique value for Section_identifier.

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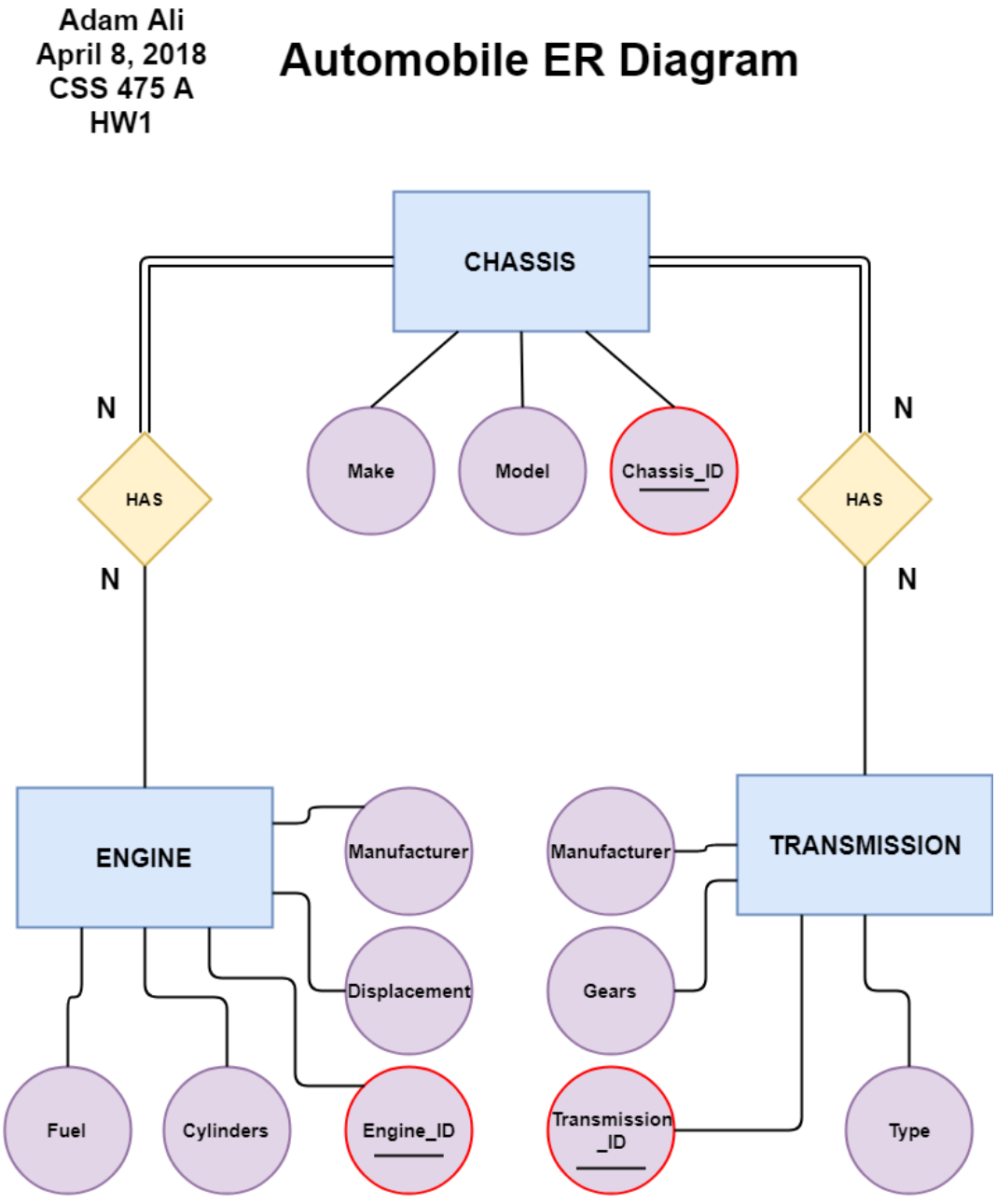
4. (11 points) Choose a database application (cannot be the same as the University or Company examples in the textbook) with which you are familiar and contains at least 3 entity types (tables). Design & draw the schema and show a sample database for that application, using the notation similar to Figures 1. List (or draw) all relationships and constraints you think are necessary for this schema. Think of at least 2 types of different users for your database, and design a view for each. Need to describe or draw the view and list what type of users the view is designed for.



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Automobile Sample DB

CHASSIS

Chassis_ID	Make	Model	Engine_ ID	Transmission_ID
18-ASTN-DB10	Aston Martin	Vantage	M178	8HP75
18-MB-AMGGT	Mercedes-Benz	AMG GT	M178	7GS
18-GM-CTSV	Cadillac	CTS-V	LT4	8L90

ENGINE

Engine_ID	Manufacturer	Displacement	Cylinders	Fuel
M178	Daimler AG	4.0 Twin Turbo	8	Gas
LT4	General Motors	6.2 Supercharged	8	Gas

TRANSMISSION

Transmission_ID	Manufacturer	Type	Gears
8L90	General Motors	Auto	8
8HP75	ZF Friedrichshafen	Auto	8
7GS	Daimler AG	DCT	7

Automobiles often share components. For any given CHASSIS, it can be associated with N ENGINEs and N TRANSMISSIONs. This is because one CHASSIS can have multiple drivetrain options.

Similarly, for any given ENGINE or TRANSMISSION, it can be associated with N CHASSISs. This is because the same drivetrain components can be used in vehicles of multiple makes and models.

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Automobile DB / Assembly Line View

UNIT

Chassis_ID	Engine_ ID	Transmission_ID
18-ASTN-DB10	M178	8HP75
18-MB-AMGGT	M178	7GS
18-GM-CTSV	LT4	8L90

Generally, an automaker assembly line is not concerned with the colloquial naming of it's products. Pure IDs are all that's required to discern what drivetrain components go into what chassis. This sort of view is ideal for incoming automobile orders.

Automobile DB / Customer View

CAR

Make	Model	Displacement	Cylinders	Type
Aston Martin	Vantage	4.0 Twin Turbo	8	Auto
Mercedes-Benz	AMG GT	4.0 Twin Turbo	8	DCT
Cadillac	CTS-V	6.2 Supercharged	8	Auto

A customer that wants to compare vehicles is not concerned with internal manufacturer code names for vehicle components. Rather, they are more likely interested in the colloquial model names and drivetrain summary that factor into their purchasing decision.