Escuela de Ingeniería Informática / Databases / EXERCISES - MAY 2016

ER MODEL (40%)
Develop an Entity-Relationship diagram (capturing the most semantics), using extended features of the E-R model if needed, and then **reduce it to a set of relations (tables) in the relational model**. The universe of discourse is a company that has flats for rent.

- The company has several offices throughout the country. Each office has a staff, and a manager that is in charge of the office. Other information of interest for an office is the office number (different for each office), the address, and the telephone.
- There is additional information about managers, including the date when the manager got in charge of the office, and the incentive the manager receives depending on the performance of the office.
- For employees, the company keeps the DNI, employee ID, address, telephone, salary, and the starting date of employment at the office.
- Each office has a number of flats to let. Each flat gets a different flat ID. Besides, the address, type of flat (centre, outskirts), number of rooms, rental price, and the owner of the flat.
- Each employee administers all the things related to a specific flat. In some special cases, up to 3 employees can administer a flat.
- The owner of a flat can be an individual, or a company. In the case of individuals, just the DNI of the owner, name, address, and telephone are needed. For companies, it is the CIF (company code), name, address, telephone, and the contact person.
- People interested in visiting a flat in order to rent it are potential tenants (the customers). A customer can call a particular office to make an appointment to visit a flat in a specific date. The customer will always be accompanied by one of the employees administering the flat when visiting. As a result of the visit, customer opinions on the flat are recorded.
- In order to manage the customers, and offer them flats, the DNI of the customer, together with the name, address, telephone, favourite type of flat, and max. rental price are recorded.

List the CONSTRAINTS NOT CAPTURED IN THE DIAGRAM

Note: Only the fundamental attributes needed to understand the schema should be drawn on the diagram. Represent in the broadest way (the most reasonable way) the parts that are not completely defined by the previous wording. Explain the representation chosen in each case.

SQL (40%)
Write SQL queries (reduce to ANSI SQL86 (SQL1) if a later version is used), using the database in the annex...
   a) Get the part IDs (P#) supplied for some project in London by a London supplier.
   b) Get the name of the projects (NOMJ) that are supplied with some part from London, and for which the total number of parts supplied (to the project) is greater than 150.
   c) Get the name of the parts that are supplied to all the projects developed in the same city where the part is manufactured.
   d) Get pairs of project IDs and names (J#, NOMJ, J#, NOMJ) that are developed in the same city, and that also have at least one supplied part in common
         Write this query in Relational Algebra as well

NORMALIZATION (20%)
Find a lossless join (LJ), dependency preserving (DP) decomposition, normalized as best as possible in 3NF or BCNF (minimal number of schemas and redundancy), using the schema R = (A, B, C, D, E, F, G, H, I, J, K), and the set of functional dependencies F::
   R = (A, B, C, D, E, F, G, H, I, J, K)

F =   {   E → FB,
                 BG → E,
                 D → IJ,
                 G → AFH
        }

Mark the normal form of each relation. Show that the decomposition is in fact LJ (Lossless Join) and DP (Dependency Preserving).

ANNEX

Supplier (S):   Suppliers of parts for projects
Part (P) :   Parts
Project (J):   Projects
SPJ   :   Supplier linked with the parts supplied for each project

Supplier (S): Supplier ID, name, state, city

S#	SNAME	STT	SCITY
s2	salazar	20	londres
s1	jaramillo	10	paris
s3	bernal	30	paris
s4	caicedo	20	londres
s5	aldana	30	atenas

Part (P): Part ID, name, color, weight, city of manufacturing

P#	PNAME	COLOR	WGT	PCITY
p1	tuerca	rojo	12	londres
p2	perno	verde	17	paris
p3	tornillo	azul	17	roma
p4	tornillo	rojo	14	londres
p5	leva	azul	12	paris
p6	rueda	rojo	19	londres

Project (J): Project ID, name, city

J#	JNAME	JCITY
j1	clasificadora	paris
j2	perforadora	roma
j3	lectora	atenas
j4	consola	atenas
j5	cotejadora	londres
j6	terminal	oslo
j7	cinta	londres

SPJ: Supplier ID, Part ID, Project ID, quantity of parts supplied by the supplier to the project

S#	s4	P#	p6
s1	s5	p1	p2
s1	s5	p1	p2
s2	s5	p3	p5
s2	s5	p3	p5
s2	s5	p3	p6
s2	s5	p3	p1
s2	s5	p3	p3
s2	s5	p3	p4
s2	s5	p3	p5
s2	s5	p5	p6
s3		p3	
s3		p4	
s4		p6	

J#	QTY
j1	200
j4	700
j1	400
j2	200
j3	200
j4	500
j5	600
j6	400
j7	800
j2	100
j1	200
j2	500
j3	300
j7	300
j2	200
j4	100
j5	500
j7	100
j2	200
j4	1000
j4	1200
j4	800
j4	400
j4	500