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Lecture notes prepared by:

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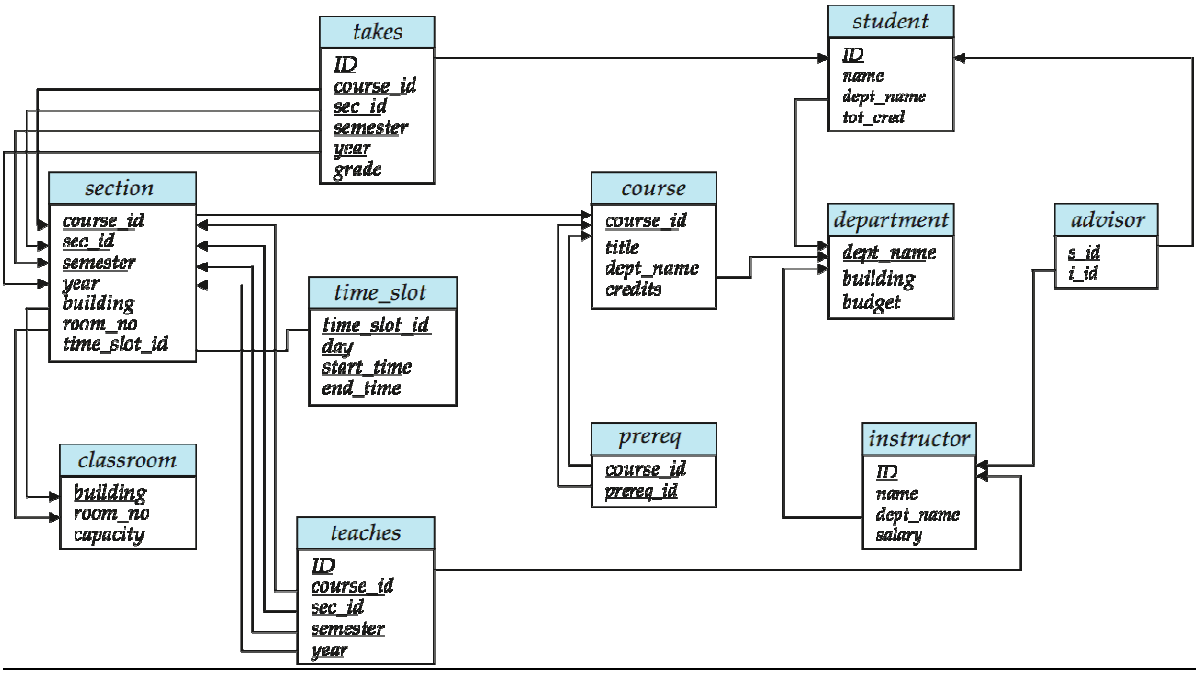

Let us apply relational algebra to the above diagram.

Q. Get the list of all student IDs

π_{ID}(student) where π is the projection operator

Q. Get the titles of all courses offered by the CSE department.

Step 1: First, we use the selection operator :

$R_1 \longleftarrow \sigma_{dept\_name=CSE}$(course)

Thus R_1 represents the table of courses offered by the CSE department. But we need only the titles of these courses.

Step 2: Now use the projection operator:

$\pi_{title}(R_1)$ this is the required expression

Q. Get the list of all departments which have at least 1 student and instructor with the same name.

Step 1: $R_1 \longleftarrow$ student $\bowtie_{name,dept\_name}$ instructor

Join operator

This gives the table containing those students/instructors having the same names. But the table also contains columns for salary, ID etc.

Step 2: $\pi_{dept\_name}(R_1)$

This is the required expression.

‘ / ’ and ‘ % ’ operators

A	B
α	1
α	2
α	3
β	1
γ	1
δ	1
δ	3
δ	4
∈	6
∈	1
β	2

r

B
1
2

s

If some value ‘x’ present in column A of ‘r’ is not associated with all values present in B of ‘s’ then x is present in r%s.

Therefore, $r\%s = \pi_A ((\pi_A(r) \times s) - r)$

r/s= complement of $r\%s = \pi_A(r) - (r\%s) = \pi_A(r) - \pi_A ((\pi_A(r) \times s) - r)$

Therefore, r/s gives:

A
α
β

Conversion of ER to Relational

Strong entity set:

Let E be a strong entity set with attributes $a_1,a_2,...,a_n$. We represent this entity by a table called E with n distinct columns, each of which corresponds to one of the attributes of E. Each row of the table corresponds to one entity of the entity set E.

Complex attribute:

If there is a complex attribute, we create a separate attribute for each component attribute.

Multi-valued attribute:

If there is a multi valued attribute (say ‘A’), then we have two separate tables- in the first table we have columns for all the attributes of E except for the multivalued attribute ‘A’ and in the second table we have columns representing 1) this attribute ‘A’ , and 2) the primary key of the entity set E.

Weak entity set:

Let A be a weak entity set with attributes $a_1,a_2,...,a_m$. Let B be the strong entity set on which A depends. Let the primary key of B consist of attributes $b_1,b_2,...,b_n$. We represent the entity set A by a table with one column for each attribute of the following set:

$$\{a_1,a_2,...,a_m\} \cup \{b_1,b_2,...,b_n\}$$

Relationship sets:

Let R be a relationship set, let $a_1,a_2,...,a_m$ be the set of attributes formed by the union of the primary keys of each of the entity sets participating in R, and let the descriptive attributes (if any) of R be $b_1,b_2,...,b_n$. We represent this relationship set by a table called R with one column for each attribute of the following set:

$$\{a_1,a_2,...,a_m\} \cup \{b_1,b_2,...,b_n\}$$