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CSCI 3287

HW 4

1. **Using the database described in figure 1.2 (page 8 from the textbook), specify the following queries as relational algebra expressions**:
   1. Retrieve the transcript—a list of all courses and grades—of ‘Smith’
      1. Find ‘Smith’ in STUDENT:
         1. σName=’Smith’(STUDENT)
         2. ‘Smith’ is associated with Student\_number 17
      2. Join with GRADE\_REPORT to get tupples associated with ‘Smith’:
         1. σStudent\_number=17(GRADE\_REPORT)
      3. Join with COURSE to get Course\_number:
         1. σStudent\_number=17(GRADE\_REPORT)⋈SECTION
      4. Join with COURSE to get Course\_name:
         1. (σStudent\_number=17(GRADE\_REPORT)⋈SECTION)⋈COURSE)
      5. Projection: Retrieve Course\_name and Grade:
         1. πCourse\_n​ame,Grade​((σStudent\_n​umber=17​(GRADE\_R​EPORT)⋈SECTION)⋈COURSE)
   2. List the names of students who took the section of the ‘Database’ course offered in fall 2008 and their grades in that section
      1. Find Course\_number of ‘Database’ in COURSE:
         1. σCourse\_name=’Database’(COURSE)
      2. Extract Course\_number (CS3380) and find any sections that match:
         1. σCourse\_number=’CS3380’∧Semester=’Fall’∧Year=08(SECTION)
      3. Extract Section\_identifier (135) and find matching students in GRADE\_REPORT:
         1. σSection\_identifier=135(GRADE\_REPORT)
      4. Join with STUDENT to get Name:
         1. (σSection\_identifier=135(GRADE\_REPORT)⋈STUDENT)
      5. Projection: Retrieve Name and Grade:
         1. πName,Grade​(σSection\_i​dentifier=135​(GRADE\_R​EPORT)⋈STUDENT)
   3. List the prerequisites of the ‘Database’ course
      1. Find Course\_number of ‘Database’ (CS3380):
         1. σCourse\_n​umber=′CS3380′​(PREREQUISITE)
      2. Projection to get Prerequisite\_number:
         1. πPrerequisite\_n​umber​(σCourse\_n​umber=′CS3380′​(PREREQUISITE))
   4. Display the content of the RESULT relation for query “b” above
      1. A screenshot of a document

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2. **Using the database below, specify the following queries as relational algebra expressions**:
   1. List of products (id, name and quantity) to be delivered to stores/clients in Colorado
      1. Find clients in Colorado:
         1. σState=′CO′​(CLIENT)
      2. Extract Client\_id:
         1. πClient\_i​d​(σState=′CO′​(CLIENT))
      3. Find the invoices for these clients:
         1. INVOICE⋈πClient\_i​d​(σState=′CO′​(CLIENT))
      4. Extract Invoice\_number:
         1. πInvoice\_n​umber​(INVOICE⋈πClient\_i​d​(σState=′CO′​(CLIENT)))
      5. Find the products and quantities from ITEM:
         1. ITEM⋈πInvoice\_n​umber​(INVOICE⋈πClient\_i​d​(σState=′CO′​(CLIENT)))
      6. Join with PRODUCT to get product descriptions:
         1. (ITEM⋈πInvoice\_n​umber​(INVOICE⋈πClient\_i​d​(σState=′CO′​(CLIENT))))⋈PRODUCT
      7. Projection to get Product\_id, Description, and Quantity:
         1. πProduct\_i​d,Description,Quantity​((ITEM⋈πInvoice\_n​umber​(INVOICE⋈πClient\_i​d​(σState=′CO′​(CLIENT))))⋈PRODUCT)
   2. List product description and category name of products that are not part of any invoice
      1. Find all Product\_id in ITEM:
         1. πProduct\_i​d​(ITEM)
      2. Find products not in invoices:
         1. PRODUCT−πProduct\_i​d​(ITEM)
      3. Join with CATEGORY to get Category\_name:
         1. (PRODUCT−πProduct\_i​d​(ITEM))⋈CATEGORY
      4. Projection to get Description and Category:
         1. πDescription,Category​((PRODUCT−πProduct\_i​d​(ITEM))⋈CATEGORY)
   3. Total amount (quantity \* price) of all electronics listed in an invoice
      1. Find Category\_id for Electronic:
         1. σCategory=′Electronic′​(CATEGORY)
      2. Extract Category\_id (1):
         1. πCategory\_i​d​(σCategory=′Electronic′​(CATEGORY))
      3. Find Product\_id for Electronics:
         1. σCategory=1​(PRODUCT)
      4. Join with ITEM to get quantities:
         1. ITEM⋈σCategory=1​(PRODUCT)
      5. Compute Quantity \* Price:
         1. ∑(Quantity×Price)(πQuantity,Price​(ITEM⋈σCategory=1​(PRODUCT)))
   4. Display the content of the RESULT relation for query “c” above
      1. Total\_amount = (3 \* 250) + (10 \* 900) + (10 \* 250) = 750 + 9000 + 2500 =
      2. A table with numbers and numbers

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