CS1555 Recitation 5 – Solution

Objective: To practice relational algebra, especially aggregations, joins, and division.

Consider the following relation schemas:

STUDENT (sid, name, class, major)

STUDENT \_DIR (id, address, phone)

FK: (id) → STUDENT (sid)

COURSES\_TAKEN (course\_no, term, sid, grade)

FK: (course\_no) → COURSE (course\_no); (sid) → STUDENT (sid)

COURSE (course\_no, course\_name, level)

INSTRUCTOR (id, fname, lname)

COURSES \_OFFERED(course\_no, term, instructor\_id)

FK: (course\_no) → COURSE (course\_no); (instructor\_id) → INSTRUCTOR (id)

Write a relational algebra query using the nested notation for each of the queries below:

1. Find for each instructor, the course names of the courses he/she was teaching in Fall 19. List in addition to the course name, the first name and the last names of the instructor.

COURSE.name, INSTRUCTOR.fname, INSTRUCTOR.Lname (term=’Fall 19’

(INSTRUCTOR▷◁ INSTRUCTOR.id = COURSES\_OFFERED.instructor\_id

(COURSE \* COURSES\_OFFERED)))

1. List the sid, name, and address (if available) of all students.

sid, name, address(STUDENT ]▷◁STUDENT.sid=STUDENT\_DIR. id STUDENT\_DIR)

*(note the left outer join)*

Write a relational algebra query using the sequence notation for each of the queries below:

1. Find the total number of students who have enrolled in the course “Operating Systems”*.*

OS\_TAKING sid(

COURSE.name = 'Operating Systems' (COURSE\_TAKEN \* COURSE))

RSLT FCOUNT sid (OS\_TAKING)

*(or you can combine the two steps into one expression (nested operations))*

1. Find the sid(s) of the student(s) who has/have the highest GPA

STUDENT\_GPA(sid, gpa) sidFAVERAGE grade (COURSE\_TAKEN)

HIGHEST\_GPA (max\_gpa) FMAX gpa(STUDENT\_GPA)

RSLT   sid (STUDENT \_GPA ▷◁ gpa = max\_gpa (HIGHEST \_GPA) )

1. Find the sid (s) of the student(s) who has/have taken all courses at the UGrad level

COURSE\_DENOMINATOR  course\_no *(* level = 'UGrad'  COURSE)

*RSLT * sid, course\_no(COURSE\_TAKEN)) ÷ COURSE\_DENOMINATOR

1. Find for each instructor the number of courses he/she has taught or is teaching. List the first name and the last name of each instructor along with his/her ID and number of courses.

COURSES\_TAUGHT(id, n\_courses) 🡨 instructor\_idFCOUNT course\_no

(COURSES\_OFFERED)

RSLT 🡨 COURSES\_TAUGHT \* INSTRUCTOR

1. List the SID of the students who did not enroll in any course in Fall 19.

SID\_ENROLL\_FALL19 sid( term = 'Fall 19' (COURSE\_TAKEN))

SID\_ALL sid(STUDENT)

RSLT SID\_ALL - SID\_ENROLL\_FALL19