Question 1. [8 MARKS]

Recall this schema, which we have used many times in class.

Relations

Student(<u>sID</u>, surName, firstName, campus, email, cgpa)

Course(<u>dept, cNum</u>, name, breadth)

Offering(<u>oID</u>, dept, cNum, term, instructor)

Took(<u>sID, oID</u>, grade)

Integrity constraints

Offering[dept, cNum] $\subseteq$ Course[dept, cNum]

Took[sID] $\subseteq$ Student[sID]

Took[oID] $\subseteq$ Offering[oID]

Write a query in relational algebra to find each instructors who meets both of these conditions: (1) For every student who got 100 in CSC148, they have taught that student some course (not necessarily CSC148). (2) They have never given a failing grade to anyone in any course. Use only the basic operators $\Pi, \sigma, \bowtie, \times, \cap, \cup, -, \rho$, and assignment.

Solution:

– Students who got 100 in CSC148.

$$OneHundred(sID) :=$$
$$\Pi_{sID}\sigma_{dept=\text{“}CSC\text{”} \wedge}(Took \bowtie Offering)$$