

Homework 2  
CS 3200

- 1) Represent the following queries in relational algebra and domain relational calculus, using your schema from Homework 1 problem 6 to answer this question. To assist in grading, please provide your schema from homework 1 in this homework solution.

A database will be made to store information about patients in a hospital. On arrival, each patient's personal details (name, address, Insurance, and telephone number) are recorded where possible, and they are given an admission number. They are then assigned to a particular ward (Emergency, Cardiology, Oncology, Maternity, Pediatric, Psychiatric, Intensive care, Neurology). In each ward there are a number of doctors and nurses. A patient will be treated by one doctor and several nurses over the course of their stay, and each doctor and nurse may be involved with several patients at any given time.

- a) List all patients named 'Khan'. (10 points)
  - b) List all patients named 'Jones' that are in the Pediatric ward. (10 points)
  - c) List all of the patients admitted to the Oncology ward. (10 points)
  - d) List the nurses within the Oncology ward that has treated all Oncology patients. (20 points)
- 2) Given 2 relations R1 and R2 where R1 contains N1 tuples and R2 contains N2 tuples and  $N2 > N1 > 0$ , give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational expressions. In each case, state any assumptions about the schemas for R1 and R2 needed to make the expression meaningful.  $R1 \cup R2$ ,  $R1 \cap R2$ ,  $R1 \times R2$ ,  $R1 - R2$ ,  $\sigma_{a=5}(R1)$ ,  $\pi_a(R1)$ ,  $R1/R2$  (30 points)
  - 3) Give a set of FDs for the relation schema R(A,B,C,D) with primary key AB under which R is in 2NF but not in 3NF. (20 points)