Databases

(a) (i) Define the operators in the core relational algebra. [5 marks]

(ii) Define the domain relational calculus. [4 marks]

(iii) Show how the relational algebra can be encoded in the domain relational calculus. [3 marks]

(b) A constraint can be expressed using relational algebra. For example, $R = \emptyset$ specifies the constraint that relation $R$ must be empty, and $(R \cup S) \subseteq T$ specifies that every tuple in the union of $R$ and $S$ must be in $T$.

Consider the following schema.

RockStar(name, address, gender, birthday)
RockManager(managername, starname)

(i) Give a constraint to express that rock stars must be either male or female. [1 mark]

(ii) Give a constraint to express the referential integrity constraint between the RockStar and RockManager relations. (Note: starname is intended to be a foreign key.) [3 marks]

(iii) Give a constraint to express the functional dependency $name \rightarrow address$ for the RockStar relation. [4 marks]