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.

\[
\text{RockStar}(\text{name, address, gender, birthday}) \\
\text{RockManager}(\text{managername, starname})
\]

(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 → address for the RockStar relation. [4 marks]