

COMPUTER SCIENCE TRIPOS Part IA – 2025 – Paper 3

1 Databases (djg11)

- (a) X , Y and Z are sets stored as relations. A user wishes to compute $X \cap (Y \cup Z)$ and writes the following query:

```
select X.A from X join Y join Z where X.A=Y.A or X.A=Z.A
```

Explain whether this SQL is correct or provide a working SQL query.

[4 marks]

- (b) This part is about lists and sets stored as relations. Your answers must not use modern features of SQL that allow collections inside rDBMS fields.

- (i) Give two differences between a set and a list in Computer Science.

[1 mark]

- (ii) Give an rDBMS schema for a list. Give also a schema for a set. Each schema should consist of just one table. Briefly explain why your definitions are correct.

[3 marks]

- (iii) Consider the following two schemas: can either precisely represent a list of sets or a set of lists as one relation? Could one represent a list of lists?

[5 marks]

Foo(N , T , A) Bar(N , T , A)

A is an item, N is a natural number and T is nominally the name of a set.

- (c) (i) For three-valued logic, give a real-world example where a non-commutative outer join (ie. left or right-outer join) is useful.

[1 mark]

- (ii) Using the Relational Algebra or basic set theory, quote a baseline definition of the equijoin operation $R \bowtie_{=} S$ for two-valued logic (ie. where null values are not present).

[2 marks]

- (iii) Provide a similar definition for the left-outer join for three-valued logic.

Hint: your definition might use a tuple containing only null values, (ω, \dots, ω) , of length equal to the number of attributes in R that are not in S .

[4 marks]