

## COMPUTER SCIENCE TRIPOS Part IA – 2024 – Paper 3

### 1 Databases (djg11)

- (a) A relational algebra is defined over sets of tuples. Explain whether the relational union of two sets (relations) requires the schemas to share attribute names. Does the same consideration apply for intersection? [4 marks]
- (b) In the same relational algebra, sets with  $P$  and  $Q$  records (table lengths) are joined by a binary operator. What is the minimum and maximum number of records in the answer if the operation is union? What if it is a natural join? [4 marks]
- (c) A relational database of textbooks holds a small amount of information about each chapter of each book. Two relations (tables) are used with a total of seven distinct attribute names (fields). Draw a suitable E/R diagram and define the two corresponding relational schemas. Say what forms of key are present. [7 marks]
- (d) The textbooks all relate to a common subject area and a more detailed database is now required, perhaps storing the books themselves. What new operations might be wanted from this new system, how would you structure it and would there be benefits from enforcing consistency rules? [5 marks]