

COMPUTER SCIENCE TRIPOS Part IA – 2025 – Paper 3

2 Databases (djg11)

- (a) A vineyard makes several types of wine that use varying ratios of up to three different varieties of grape and are shipped in various shapes of wine bottle.
- (i) Draw a suitable E/R diagram, including a few additional attributes that are likely in the real world. [1 mark]
 - (ii) Give a schema for an rDBMS that hardcodes the limit of three grape types and suggest at least two rules of consistency. [3 marks]
 - (iii) Give a second rDBMS schema, where there is no limit to the number of grape types in a wine. [2 marks]
 - (iv) Using a graph database, give a schema or concrete example for the unrestricted case. [2 marks]
 - (v) Briefly discuss the relative merits of the three schemas. [2 marks]
- (b) A friend has typed out a collection of old recipe cards and stored them in an rDBMS table with two fields: (recipe_name, recipe_text). I have suggested he could instead split out the ingredients part of each recipe, storing it in structured JSON inside a third field.
- (i) Using a traditional rDBMS, discuss these two approaches. [3 marks]
 - (ii) A new rDBMS provides limited support for tables where fields contain JSON by notionally expanding the JSON into a form where it can be readily queried with traditional SQL. What problems might remain? Precisely describe the operation of two useful JSON expansions. Note that more than one field might contain JSON. How might either expansion help with the recipes? [7 marks]