

1994 Paper 13 Question 8

Databases

Describe how a data model is represented in a *relational database*, and explain how one might specify a *relational database schema*. [5 marks]

What is meant by a *referential integrity constraint* in a relational database? [3 marks]

Each year the number of tourists coming to Cambridge increases by 10%. Most of the pressure falls on a limited number of identified sites in the city centre. The Tourist Board has restricted the size of any group visiting such a site to 20, and requires a group of ten people or more to get a permit in advance. Most bookings are made either by tour operators or directly by independent guides: the Tourist Board will arrange guides for groups if asked to do so.

A database is being installed to coordinate bookings and to provide information about the opening times of sites. Each site has separate opening times for summer and winter (owing to college autonomy, changes of season differ from site to site). Permits are issued to start on the hour or on the half-hour: they are valid either for 1 hour or for 2 hours, the duration being fixed for each site. The final permits of each day are timed to expire at the site's closing time. Each site has a fixed capacity, and no booking can be accepted that would cause it to be exceeded. The charge for a permit depends only on the site and the season. (Occasionally sites are closed for several hours during the normal opening period, for example when recording is taking place in King's College Chapel. The protocol is to inform the Tourist Board at least 6 months in advance.)

The Tourist Board issues permits to visit an identified site at a given time on a given day, specifying the booking agent and the number in the group. Bookings can be made up to 6 months beforehand. Permits are issued to registered tour operators and guides on account, but in all other cases payment must be made in advance. The data held for registered guides includes not only account details but also their working hours and charges.

Design a schema for the relational database that is to record this information for the Tourist Board. You may find it helpful to use domain types **DATE**, **TIME** and **MONEY** in addition to standard programming language datatypes. You do not need to specify the transactions that maintain the database, but you should state clearly any assumptions that influence the schema design. [12 marks]