6   Databases (KM)

(*a*) Codd's 1970 paper introduced the *Relational Model* of data to address the difficulties of building database applications using the technology that was available at the time.

   (*i*)   What problems were encountered by database developers before Codd introduced the Relational Model?   [1 mark]

   (*ii*) Describe the basic elements of the Model, and explain what is meant by a *relational schema*.   [4 marks]

   (*iii*) Explain how a formal schema can assist both the application database designer and a database application programmer.   What if any are the disadvantages of adopting a mathematical description of database structure?   [5 marks]

(*b*) In 1976 Peter Chen introduced the *Entity Relationship (E-R) Model* to support a more natural description of real world data.

   (*i*)   Describe the basic elements of the Model, and explain some of the choices available to the database designer.   [4 marks]

   (*ii*) Explain what is meant by a *foreign key* in the relational model. How could you use foreign keys to represent a database described by an E-R model in relational form? To what extent are the two approaches to data modelling complementary?   [6 marks]