**E-R Modelling Exercises**

**Question: Develop ER diagrams for the given situations.**

**Scenario 1:** Create an ER model for each of the following descriptions:

(a) A large organization has several parking lots, which are used by staff.

(b) Each parking lot has a unique name, location, capacity, and number of floors (where appropriate).

(c) Each parking lot has parking spaces, which are uniquely identified using a space number.

(d) Members of staff can request the use of a parking space. Each member of staff has a unique number, name,

telephone extension number, and vehicle license number.

(e) Represent all the ER models described in parts (a), (b), (c), and (d) as a single ER model. Provide any assumptions necessary to support your model.

**Scenario 2:** A piano manufacturer wants to keep track of all the pianos it makes individually. Each piano has an identifying serial number and a manufacturing completion date. Each instrument represents exactly one piano model, all of which have an identification number and a name. In addition, the company wants to maintain information about the designer of the model. Over time, the company often manufactures thousands of pianos of a certain model, and the model design is specified before any single piano exists. A piano manufacturer employs piano technicians who are responsible for inspecting the instruments before they are shipped to the customers. Each piano is inspected by at least two technicians (identified by their employee number). For each separate inspection, the company needs to record its date and a quality evaluation grade.

**Scenario 3:** An organization wants to keep track of all the books written by his employees (authors) and the publisher responsible for publishing those books. Each publisher has a unique name; a mailing address and telephone number are also kept on each publisher. A publisher publishes one or more books; exactly one publisher publishes a book. A book is identified by its ISBN, and other attributes are title, price, and number of pages. One or more authors write each book; an author writes one or more books, potentially for different publishers. Each author is uniquely described by an author ID, and we know each author’s name and address. Each author is paid a certain royalty rate on each book he or she authors, which potentially varies for each book and for each author. An author receives a separate royalty check for each book he or she writes. Each check is identified by its check number, and we also keep track of the date and amount of each check. As you develop the ERD for this problem, follow good data naming guidelines.

**Scenario 4:** A video rental company has several branches throughout Ireland. The data held on each branch is the branch address made up of branch name, street and city, and the telephone number. Each branch is given a branch number, which is unique throughout the company. Each branch is allocated staff, which includes a Manager. The Manager is responsible for the day-to-day running of a given branch. The data held on a member of staff is his or her name, position, and salary. Each member of staff is given a staff number, which is unique throughout the company. Each branch has a stock of videos. The data held on a video is the catalogue number, video number, title, category, daily rental, cost, status, and the names of the main actors, and the director. The catalogue number uniquely identifies each video. However, in most cases, there are several copies of each video at a branch, and the individual copies are identified using the video number. A video is given a category such as Action, Adult, Children, Drama, Horror, or Sci-Fi. The status indicates whether a specific copy of a video is available for rent. Before hiring a video from the company, a customer must first register as a member

of a local branch. The data held on a member is the first and last name, address, and the date that the member registered at a branch. Each member is given a member number, which is unique throughout all branches of the company. Once registered, a member is free to rent videos, up to maximum of ten at any one time. The data held on each video rented is the rental number, the full name and number of the member, the video number, title, and daily rental, and the dates the video is rented out and date returned. The rental number is unique throughout the company.

**Scenario 4:** Projects, Inc. is an engineering firm with approximately 500 employees. A database is required to keep track of all employees, their skills, projects assigned, and departments worked in. Every employee has a unique number assigned by the firm and is required to store his or her name and date of birth. If an employee is currently married to another employee of Projects, Inc., the date of marriage and who is married to whom must be stored; however, no record of marriage is required if an employee’s spouse is not also an employee. Each employee is given a job title (e.g., engineer, secretary, and so on). An employee does only one type of job at any given time, and we only need to retain information for an employee’s current job. There are 11 different departments, each with a unique name. An employee can report to only 1 department. Each department has a phone number. To procure various kinds of equipment, each department deals with many vendors. A vendor typically supplies equipment to many departments. We are required to store the name and address of each vendor and the date of the last meeting between a department and a vendor. Many employees can work on a project. An employee can work on many projects but can only be assigned to at most one project in a given city. For each city, we are interested in its state and population. An employee can have many skills (preparing material requisitions, checking drawings, and so on), but she or he may use only a given set of skills on a particular project. (For example, an employee MURPHY may prepare requisitions for the Wicklow Refinery project and prepare requisitions as well as check drawings for Dublin Petrochemicals.) Employees use each skill that they possess in at least one project. Each skill is assigned a number, and we must store a short description of each skill. Projects are distinguished by project numbers, and we must store the estimated cost of each project.