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| Bahrain Polytechnic |
| Database Systems 1 |
| Lab Session Normalization |
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# Lab Session Normalization

### **Question 1**

Reed and Co. are a transport and removal company which specialise in removals for large corporate clients. The manager of Reed and Co. has a system for allocating removal vans to clients. The current system uses two books. The first book contains the names and details of the clients together with dates and details of the removals. Each client has a section of this book dedicated to them. When a removal is requested, the removal is entered and allocated a shipment number.

Each shipment is covered by an insurance policy. The *Insurance Ref* is the insurance policy number for the shipment. Look at these samples from the *Client* book:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Client Nbr: | | 0921 | | | Client Telephone: | | 17745268 | | |  |  |  |
| Client Name: | | Al Amsal Company | | |  |  |  |
| Client Address: | | PO BOX 34409, Seef | | |  |  |  |
| **Shipment Nbr** | **Insurance Ref** | | **From** | **To** | | **Date** | | **Time** | **Van Reg** | **Model** | **Make** | **Capacity** |
| 0017 | NT9238 | | Building 200, Road 80, Isa Town. | Builing 130, Road 40, Budaiya. | | 23/02/2010 | | 09:30 | 355320 | Convoy | LDV | 16.85m3 |
| 0019 | RT8721 | | Building 5, Road 1, Juffair. | Building 8, Road 50, Seef. | | 24/02/2010 | | 08:30 | 344201  334412 | Transit  Actros | Ford  Mercedes | 11.89m3  36.10m3 |
| 0018 | QW1211 | | Building 12, Road 23, Adliya | Building 8, Road 40, Sanabis. | | 24/02/2010 | | 11:30 | 320225 | LF | DAF | 28.45m3 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Client Nbr: | | 2711 | | | Client Telephone: | | 17444102 | | |  |  |  |
| Client Name: | | Elite Consultancy | | |  |  |  |
| Client Address: | | PO BOX 31001 | | |  |  |  |
| **Shipment Nbr** | **Insurance Ref** | | **From** | **To** | | **Date** | | **Time** | **Van Reg** | **Model** | **Make** | **Capacity** |
| 0020 | NT9008 | | Building 4, Road 20, Riffa | Building 12, Road 25, Riffa. | | 23/02/2010 | | 09:30 | 344201 | Transit | Ford | 11.89m3 |
| 0012 | RP8001 | | Building 20, Road 19, Al Ahli | Building 28, Road 29, Isa Town. | | 24/02/2010 | | 08:30 | 355320  334412 | Convoy  Actros | LDV  Mercedes | 16.85m3  36.10m3 |
| 0011 | AD6701 | | Building 4, Road 15, Isa Town | Building 9, Road 20, Isa Town. | | 24/02/2010 | | 09:30 | 320225  355320 | LF  Convoy | DAF  LDV | 28.45m3  16.85m3 |

The second book contains details of the removal vans that Reed and Co. own. Each removal van has a unique registration number. To allocate a van to a removal the manager writes the van number against the removal in the *Client* book. Each van has only one removal allocated at a particular time and each removal only has one van allocated to it. This is a sample from the *Van* book:

|  |  |  |  |
| --- | --- | --- | --- |
| **Van Reg** | **Model** | **Make** | **Capacity** |
| 344201 | Transit | Ford | 11.89m3 |
| 355320 | Convoy | LDV | 16.85m3 |
| 320225 | LF | DAF | 28.45m3 |
| 334412 | Actros | Mercedes | 36.10m3 |

1. Complete the normalisation of the shipment details by producing entities in third normal form (3NF).
2. Construct an entity-relationship to represent the 3NF model. You should indicate the primary and foreign keys of each entity.
3. Model the normalised database using Enterprise Architect.

### **Question 2**

A library runs a record system based on a card index. They have found several problems with this system. When asked by a computer consultant for information to help with an analysis they gave the following details:

* There are many copies of the same book
* A person can borrow many books
* A particular copy will only be borrowed by one person at a time
* Only details of current loans are held in the system. They are deleted as the books are returned

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Catalogue number** | **Title** | **Author** | **Publisher ID** | **Publisher name** | **Publisher address** | **Copy serial no** | **Borrower no** | **Borrower name** | **Date due back** |
| 1234 | Normalisation | B. Goodet | AJ8778 | Seagull | London | 1234-3 | 1234 | Sneddon | 06/02/09 |
| 1234 | Normalisation | B. Goodet | AJ8778 | Seagull | London | 1234-2 | 2245 | Smith | 09/04/09 |
| 5588 | White falls | E. Dover | KI9908 | Scott | Edinburgh | 5588-1 | 4452 | Riley | 02/04/09 |
| 5588 | White falls | E. Dover | KI9908 | Scott | Edinburgh | 5588-2 | 2245 | Smith | 09/04/09 |
| 5588 | White falls | E. Dover | KI9908 | Scott | Edinburgh | 5588-3 | 1369 | Fraser | 03/03/09 |
| 8897 | Relational Databases | K. Sneddon | AW6759 | Sobehave | New York | 8897-1 | 7788 | Walton | 09/02/09 |
| 2389 | C++ | T. Flo | AJ8778 | Seagull | London | 2389-1 | 2594 | Collins | 02/03/09 |

1. Complete the normalisation of the library record details by producing entities in third normal form (3NF). You should indicate the primary and foreign keys of each entity.  
   You must show the following:
   * 1. **UNF**
     2. **1NF**
     3. **2NF**
     4. **3NF**
2. Construct an entity-relationship to represent the 3NF model. You should indicate the primary and foreign keys of each entity.
3. Model the normalised database using Enterprise Architect.

### **Question 3**

A lecturer teaches a number of different courses. A systems analyst found of the following information about the lecturer and the college.

* A faculty may have several office locations.
* An office location belongs to a faculty.
* An office location can be occupied by more than one lecturer.
* Lecturers contact with a particular course often begins on separate days, or in fact months.
* Lecturers meet a course for one subject only.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecturer No** | **Name** | **Faculty** | **Office Loc** | **Course Code** | **Course** | **Start Date** | **Weekly Time** |
| 7146 | James | Business | Rm 22 | BM01  A01  E01 | Bus Man  Acc  Econ | 12/9/2009  11/9/2009  30/9/2009 | 4  3  7 |
| 1463 | Denis | IT | Rm 21 | CS01  P01 | Computer systems  Programming | 01/9/2009  02/9/2009 | 6  5 |
| 6455 | Phil | Business | Rm 22 | BM01  BM01  M01 | Bus Man  Bus Man  Marketing | 11/11/2009  04/10/2009  10/10/2009 | 6  4  6 |

1. Complete the normalisation of the lecturer details by producing entities in third normal form (3NF).
2. Construct an entity-relationship to represent the 3NF model. You should indicate the primary and foreign keys of each entity.
3. Model the normalised database using Enterprise Architect.

### **Question 4**

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|  | Manama Polytechnic currently makes use of a paper based system to keep track of the exams that students sit. Due to the tight schedule it is possible that a student sits more than one exam in a day.  Details of this information are shown below: |  |

**Student Record**

**Student ID:** 076342512

**Student name:** J. Yunis

**Student Year:** 0910A

|  |  |  |
| --- | --- | --- |
| **Date of exam** | **Time of exam** | **Subject ID** |
| 01/02/09 | 09:00 | Net101 |
| 01/02/09 | 14:00 | DA101 |
| 02/02/09 | 10:00 | BS101 |
| 03/02/09 | 11:00 | CS101 |
| 04/02/09 | 09:00 | LG101 |

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|  | Details of subjects taught are stored on card. A subject has only one programme leader (PL). Part of the subject card is shown below: |  |

**Subjects taught List**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subject ID** | **Subject name** | **PL ID** | **PL Name** | **PL mobile number** |
| Net101 | Networking 1 | COM | Scott | 31110201 |
| CS101 | Computer Systems 1 | COM | Scott | 31110201 |
| DA101 | Data Analysis | MAT | Darren | 33256520 |
| BS101 | Business 1 | BUS | John | 35578501 |
| LG101 | Logistics | T\_L | Carol | 33656998 |

1. Complete the normalisation of the exam tracking details by producing entities in third normal form (3NF). You should indicate the primary and foreign keys of each entity.
2. Construct an entity-relationship to represent the 3NF model. You should indicate the primary and foreign keys of each entity.
3. Model the normalised database using Enterprise Architect.