DATABASE SYSTEMS
ASSIGNMENT 1

NOTES

- *Students should read everything presented below carefully.*
- *Your team will be randomly assigned with one topic in the "business description" section.*
- *This assignment 1 is worth 15% of the overall grade.*
- *This assignment is on relational data modelling.*
- *Appropriate software can be used to support your design.*
- *Plagiarism must be avoided. Otherwise, zero mark is given.*

I. BUSINESS DESCRIPTION

1.1 HOSPITAL DATABASE

A hospital X needs to build a management information system to manage the information of their patients, doctors, and nurses.

The database of hospital X needs to store the information of employees (doctors and nurses) including: a unique code, full name consisting of first name and last name, date of birth, gender, address, start date (first day of work), phone number(s), and speciality with its related name and degree's year. The hospital has many departments. Each department has a unique code, a title, and a dean who is a doctor. The employees have to belong to a specific department. A department has at least one or many employees. The dean must hold a specific speciality and has had more than 5 years of experience since the date he or she was awarded the speciality degree.

The patients have to provide with the hospital their information such as: full name (first name and last name), date of birth, gender, address, and phone number. After receiving their information, the system will store them into the database, and generate a unique code to identify each patient simultaneously. Patients are divided into two types: outpatients and inpatients. The hospital also wishes to use the first two characters to determine the patient type by the unique code. If one is an outpatient, the unique code for him or her starts with "OP," which is then followed by 9 digits such as "OP000000001." If one is an inpatient, the unique

code for him or her starts with “IP,” which is then followed by 9 digits such as “IP000000001.”

- For outpatients, the information of the examining doctor needs to be stored. The outpatients can have many examinations with their examining doctor. The hospital needs to store the details of each examination such as: examination date, diagnosis, the next examination date if any, medications, and fee.
- For inpatients, some information is added such as: date of admission, treating doctors, caring nurse, diagnosis, sickroom, date of discharge, and fee. After admitting to the hospital, a patient can receive treatment from at least one doctor. A doctor can treat many patients at the same time, or sometimes, he has no patients to treat. The hospital needs the details of each treatment such as: treatment period (start date and end date), result, and medications. Each inpatient is taken care of by a nurse; a nurse can take care of many inpatients at the same time. Furthermore, when a patient is recovered and his or her last treatment has been confirmed as “recovered” by the doctor, he or she will be discharged from the hospital. As a result, the discharge date must be recorded by the system.

The information of a medication is also stored in the database. This information consists of a unique code, name of the medication, effects, price, and expiration date. A medication is provided by one or more providers, and one provider may provide many types of medication. A provider is tracked by its unique number, name, address, and phone. Moreover, the hospital also want to keep the imported medication information including imported date, price, and quantity. In case one medication is out-of-date, it will be automatically marked so in the database.

1.2 FABRIC AGENCY DATABASE

The agency Y supplies the wholesale fabric by bolts for their customers. Each bolt belongs to a specific category such as: silk, khaki, crewel, jacquard, faux silk, and damask. A bolt has a code that is unique within a category, and a length. Each category of fabric has a unique code, name, color, current price(s) (including the price, and the date when that price was made), and quantity (the number of bolts of this category in the warehouse).

The agency takes fabric sources from many suppliers. Each supplier provides many different categories of fabric for the company. However, each category is stemmed from only one supplier. The database needs to store some information about suppliers such as: a unique code, name, address, bank account, tax code, phone number(s). Whenever fabric sources are imported into the warehouse, the quantity of each category, the date, the purchase price must be stored in the database.

A customer has a unique code, name (first and last), address, phone number(s), arrearage (unpaid debt), and partial payments (including the date and amount of money). For example, a customer has $1000 in arrears, he or she is allowed to partially pay for the agency (e.g., he or she pays $200 at the first time, and then $300 for the next, and so on till he or she gets out of debt).

A customer makes an order. Each order contains one or more bolts, and processed by an employee at a specific date and time. An order has a unique code, and a total price. Information about employee consists of a unique code, name (first and last), gender, address, and phone. When a customer makes an order, the system needs to track the order status by time, including “new”, “ordered”, “partial paid”, “full paid”, or “cancelled”. If the order is cancelled, the agency staffs need to input the reason for that cancellation.

Moreover, the agency wants to track the history payment of a customer for each order he or she successfully made. In case the arrearage is over $2000, the system has to put that customer in “warning” mode and alert the agency. If that case stays for more than 6 months, the arrearage is marked as “bad debt”.

The agency has different types of employees: managers, partner staffs, operational staffs, and office staffs. One partner staff will take care of one or more suppliers while one office staff will be in charge of one or more customers. One supplier is taken care by only one partner staff whereas one customer is cared by only one office staff. The operational staff will be in charge of customer order.

Note: **‘Bolt’** is a unit of measurement used as an industry standard for a variety of materials from wood to canvas, typically materials stored in a roll.

1.3 QUARANTINE CAMP DATABASE

Due to the Covid-19 outbreak, a quarantine camp has been set up to isolate and monitor people under investigation for 21 days. Those people admitted to the quarantine camp are called "patient". The camp stores patient information including unique number, full name, identity number, phone, gender, and address. In addition, it wants to record the patient comorbidities (e.g., cancer, chronic lung diseases, diabetes, heart conditions, immunocompromised state) because they will put a patient in a high-risk situation. In parallel, a patient needs to be tracked with his or her symptoms such as fever, dry cough, tiredness, aches and pains, sore throat, diarrhoea, conjunctivitis, headache, loss of taste or smell, a rash on skin, or discolouration of fingers or toes. Some of them may be serious like difficulty breathing or shortness of breath, chest pain or pressure, and loss of speech or movement. Unlike comorbidity, a patient symptom is different from time to time.

The camp has different types of people: managers, doctors, nurses, staffs, and volunteers. One doctor will be designated as the head of the camp. Each has its own responsibility. Due to the lack of resources, volunteers may help nurses and staffs in some activities like admission, testing execution, or patient care. Besides, the camp has several buildings, each has many floors and rooms. Each room has a limited capacity. There are three types of room: normal room, emergency room, and recuperation room. When admitted by a staff, a patient is assigned into a room based on his or her current condition. Sometimes, a patient is moved from his or her room to the emergency room or the recuperation room. So, it is important to track a patient location history. The camp needs to know the admission date, from where the patient is moved to the camp, the staff information, and the testing information if any. A staff may admit many patients, and a patient is admitted by a staff.

The testing information includes those as described below:

- PCR test: the result is true (positive) or false (negative). In case it is positive, the camp wants to track the corresponding cycle threshold (ct) value.
- Quick test: the result is true (positive) or false (negative). In case it is positive, the camp wants to track the corresponding cycle threshold (ct) value.

- SPO2: which is the percent saturation of oxygen in the blood. The test measures blood oxygen levels, indicated by percentage (%).
- Respiratory rate: it is measured by how many breaths per minute.

A patient may have many testing during his or her stay. If the SPO2 is smaller than 96% and the respiratory rate is larger than 20 breaths per minute, the patient is marked "warning" and needs a healthcare action from the doctors. In case the patient has no clinical sign and the test is either negative or positive whose cycle threshold is larger than 30, he or she will be discharged from the camp. Neither of them, the patient will be tested for every 3 days by Quick test. It is important to track the discharge date for each patient.

A patient can receive treatment from at least one doctor. A doctor can treat many patients at the same time, or sometimes, he has no patients to treat. The camp needs the details of each treatment such as: treatment period (start date and end date), result, and medications. Each patient is taken care of by a nurse; a nurse can take care of many inpatients at the same time. The information of a medication is also stored in the database. This information consists of a unique code, name of the medication, effects, price, and expiration date.

II. REQUIREMENTS

1. Design a fully labelled (E)ERD according to your business description. The diagram has to show appropriate entities (with key attributes underlined), relationships, cardinality ratios, and optional & mandatory membership classes.
2. Mapping your (E)ER diagram above to a relational database schema.
3. Identify all constraints not shown in your (E)ER diagram.

III. SUBMISSION DEADLINE

As announced on LMS.

IV. HOW TO SUBMIT

The group leader submits your team work on LMS with only one single zip file. The file name will be <class code>_<team number>_<submiter name>.zip (e.g., CC02_1_NguyenVanA.zip). The zip file may contain resources as follows:

- Team member list with percentage contribution
- A single word file containing your (E)ER diagram, relational database schema, and constraints
- Other supporting files (if any)

Note: Do not forget to press "Submit" button.

V. EVALUATION

Assignment 1 (10%)
Mark: 8-10 ❑ Correctly identify all entities and their relationships ❑ Identify all appropriate attributes including primary keys of each entity ❑ Correctly state the membership class of each entity ❑ (E)ER diagram is correctly drawn with appropriate labels ❑ Mapping (E)ER diagram to a relational database schema correctly ❑ All constraints are correctly identified
Mark: 6-7.5 ❑ Correctly identify all entities and their relationships ❑ Identify all appropriate attributes including primary keys of each entity ❑ Correctly state the membership class of each entity ❑ (E)ER diagram is clearly drawn (may contain small mistakes) ❑ Mapping (E)ER diagram to a relational database schema may have a few mistakes ❑ All constraints are identified but slightly incorrect
Mark: 5-5.5 ❑ Correctly identify most of the entities and their relationships ❑ Identify most of the appropriate attributes including primary keys of each entity ❑ State most of the membership class correctly ❑ (E)ER diagram is drawn (may contain mistakes) ❑ Mapping (E)ER diagram to a relational database schema may have several mistakes ❑ All constraints are identified but incorrect
Mark: 4-4.5 ❑ Correctly identify most of the entities and their relationships ❑ Identify most of the appropriate attributes including primary keys of each entity ❑ State most of the membership class correctly ❑ (E)ER diagram contains mistakes ❑ Mapping (E)ER diagram to a relational database schema may have significant mistakes ❑ All constraints are slightly neglected

Mark: 0-3.5

- Entities and their relationships are not identified correctly
- Attributes or primary keys of each entity are not identified
- Membership class are not correctly stated
- (E)ER diagram is not completed
- Mapping (E)ER diagram to a relational database schema is not done
- All constraints are totally neglected

---------- GOOD LUCK! ----------