

### Assignment 3 (8% of total marks)

**Due date:** 27 May 2018

#### Scope:

This assignment includes the tasks in implementation of XML documents, DTD, XML Schema, and normalization of relational schemas.

#### Assessment criteria:

Marks will be awarded for:

- Correct,
- Comprehensive, and
- Appropriate

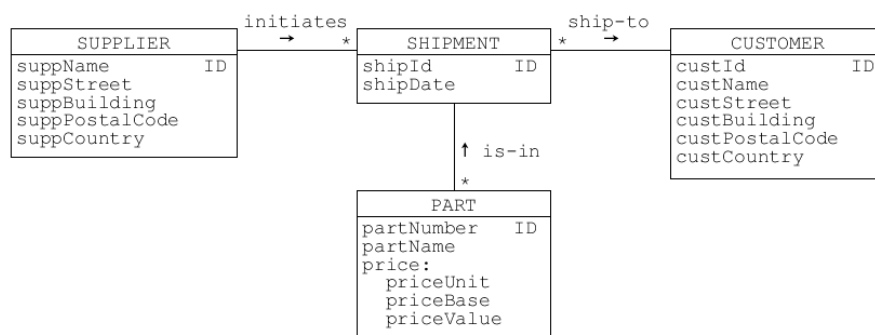
application of the materials covered in this subject.

### Assignment Specification:

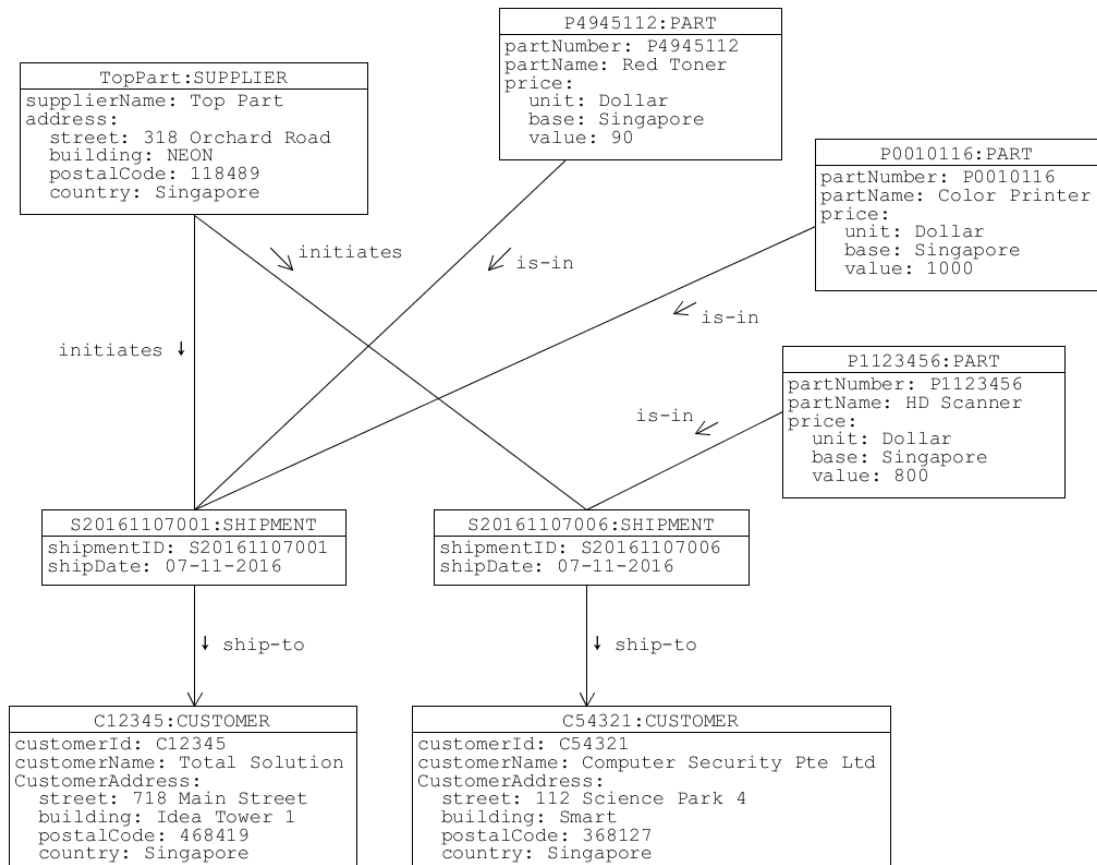
#### Task 1 (1 mark) XML Document

A logistic company received a shipment contract to deliver parts from suppliers to customers. Suppliers ship parts to customers. A supplier may initiate one or more shipments to customers. In a shipment, there may be one or more parts. A customer may receive many shipments.

The conceptual model describing the relation of the entities in the above structural relation is given below.



The information of the shipments is depicted in the following object diagram that describes the structural relationship:



Create an XML document to store the information described above. Your XML document must be well formed.

### Deliverables

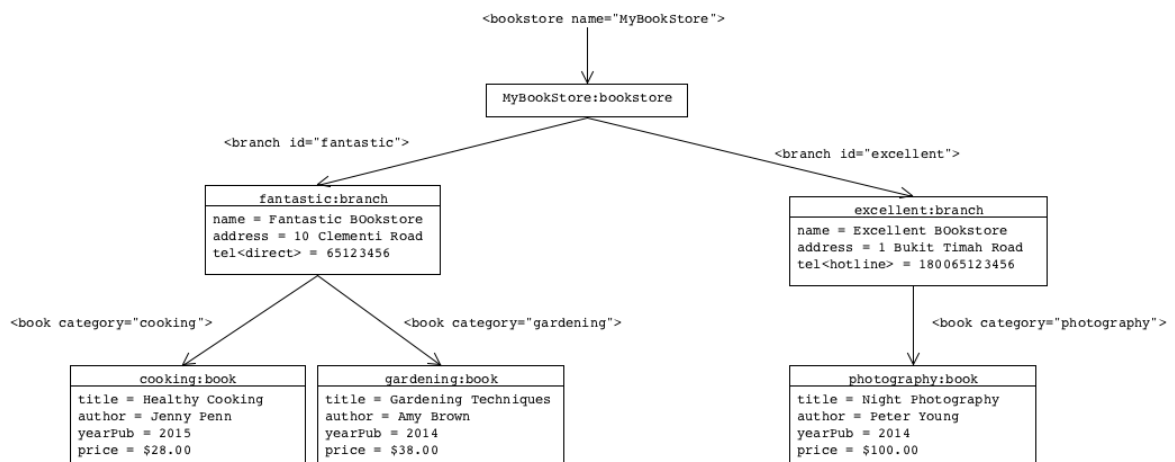
You are required to submit a file containing the XML document. You may use any text-editor to construct your XML document or any appropriate XML editor to generate the document. Your document must be well formed and it must not have any redundancies. Name your report **Solution1.xml**.

## Task 2 (1 mark)

### Document Type Definition (DTD)

MyBookStore, a neighbourhood bookstore, has two branches selling hobbies books. We have information about the bookstore and the books sold in each branch. The first branch, named Fantastic Bookstore, is located at 10 Clementi Road and has a direct line telephone number 65123456. Fantastic Bookstore currently carries two categories of books. The first category is hobby book on cooking. The title of the book is "Healthy Cooking". It is authored by "Jenny Penn" and published in year 2015. The price of the book is \$28.00. The second category is hobby book on gardening. The title of the book is "Gardening Techniques", authored by "Amy Brown". The book was published in year 2014, and priced at \$38.00. The second branch, named Excellent Bookstore, is located at 1 Bukit Timah Road. Instead of giving the direct lines to its staff, Excellent Bookstore uses a hotline telephone, and its number is 180065654321. Excellent Bookstore currently carries only one category of book. The category of the book is on photography. The title of the book is "Night photography". It is authored by Peter Young and published in the year 2014. The price of the book is \$100.

The above described information has the following structural relationship:



Write a well formed XML document that contains information described above and add Document Type Definition (DTD) that uses external reference to validate the structures of the document. Your XML document must be well formed.

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**Deliverables**

You are required to submit a file containing the XML document and a file containing Document Type Definition (DTD). The document must validate against externally defined DTD. You are allowed to use any text-editor to create your XML document and DTD. Name the files **Solution2.xml** and **Solution2.dtd** respectively.

**Task 3 (2 marks)**  
**XML Schema**

In a restaurant, a customer makes orders and a waiter is taking the orders. An order consists of list of foods ordered, the quantity ordered, and special instructions. To ensure the orders are served correctly, additional information such as the table number, date order, and the time of order are also recorded.

Write an XML schema that conform to the following requirements to describe the above information:

- A namespace "<http://www.w3.org/2001/XMLSchema>" for the elements and data types used in the schema.
- A namespace "<http://www.w3school.com>" for all the elements defined in the schema.
- A default namespace "<http://www.w3schools.com>".
- To qualify all elements used by the XML instance document.
- An element table number with a minimum value of 1 and a maximum value of 50.
- An element food order consisting of three elements, the item description of type string, a quantity of type positive integer, and a special instruction of type string. The quantity is to be defaulted with a value 1.
- An element order date of type date.
- An element order time of type time.

Your XML schema must be well formed, and you may use BaseX or XMLSpear to validate your XML document.

**Deliverables**

You are required to submit a report containing the XML schema description of the information. You may use any text-editor to construct your XML schema or any appropriate XML editor to generate the schema. Name your report **Solution3.xsd**.

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**Task 4 (2 marks)**  
**Analysis of relational schemas**

Consider the specifications of the sample database domains and the respective relational tables given below. For each one of the database domains listed below discover the respective sets of valid functional dependencies in the tables. For each one of the relational schemas **identify its highest normal form**. Remember that identification of a normal form requires analysis of the valid functional dependencies and the minimal keys. **Provide justification of each answer. A solution with no comprehensive justification scores no marks.**

- a) In a product promotion fair, the promoters are engaged to promote various products. A promoter may promote more than one product, and each product may be promoted by many promoters. A promoter is paid by a commission, which is computed as a percentage of the total sales for a product. For example, if the total sales for a product is below \$1000, a promoter is paid 10% of the total sales for commission; if the total sales for a product is between \$1000 and \$5000, a promoter is paid 20%, etc. The information about the commission is stored in the following relational table.

COMMISSION (PromoterId, ProductId, TotalSale, CommissionPaid)

Find the functional dependencies and the minimal keys valid in the relational table and determine the highest normal form of the relational table.

- b) In a company, the employees are involved in many projects, and each project may have many employees working on it. The number of hours each employee works in each project, and the start date on which the employee starts working on the project are recorded in the following relational table.

EmployeeProject (EmpeNum, ProjNum, HoursWork, DateStartWorkOnProj)

Identify the highest normal form of the relational table.

- c) A building of a newly constructed wall-climbing gym has two levels. Level 1 consists of three different walls; each wall is identified as wall 1, wall 2, and wall 3. Level 2 consists of one wall, and it is identified as wall 1. Walls at level 1 are designed for easy and intermediate climbing, while wall at level 2 is designed for expert level of climbing. To promote this sport, the organizer organizes demonstration sessions inviting public for viewing. The number of places available for booking to view the demonstration are recorded in order not to overcrowd the gym during

demonstration. Information such as level number, wall number, places available for booking, and the type of demonstration (easy, intermediate, and expert) are stored in the following relational table.

WallClimbDemo (LevelNum, WallNum, PlaceAvailable, DemoType)

Identify the highest normal form of the relational table.

- d) Each customer is described by a unique customer number, a customer name, an address, and a postal code. Addresses are organized such that each address is associated with one postal code. A customer owns many different types of credit cards, such as Visa or Master, and each credit card is described by a credit card number, a credit card type, and an expiry date. The information described are stored in a relational table CustomerCreditCard as shown here:

CustomerCreditCard(custNum, custName, address, postalCode, cardType, cardNumber, cardExpDate)

Identify the highest normal form of the relational table.

### **Deliverables**

Hand in a printed report, solution3.pdf, of your analysis and explanation of your analysis on the highest normal form of the above relational tables. Make sure that your report is readable!

### **Task 5 (2 marks)**

#### **Normalization of relational tables**

Consider the following un-normalized relational table on a daily Karaoke booking information:

roomBooking(room, startTime, endTime, rateType, customer, custPhone, hourlyRate)

On a daily basis, customers may book a Karaoke room with a fees. In the event that there is no room that is available for the entire period that a customer requests, the customer may choose to book multiple rooms, one after another, in different time-slot. For an example, if a customer requests to book a room from 1:00 pm to 6:00 pm, but there is no room that is available from 1:00 pm to 6:00 pm, the customer may book a room from 1:00 pm to 3:00 pm and another room from 3:00 pm to 6:00 pm. Charges

are determined based on the room. The outlet has only 5 karaoke rooms. Each room has a different rate type. In addition, each room may have different charge depending on the time (period) when the room is booked. For an example, room 'flamingo' has a rate type 'saver' from 9:00 am to 4:00 pm. From 4:00 pm to mid-night the same room is categorized under a 'standard' rate type. Another room 'parrot' has a rate type 'premium A' from 9:00 am to 4:00 pm, and from 4:00 pm to mid-night it has a rate type 'premium B', etc.

The attributes of the relational table roomBooking satisfy the following properties:

- customer -> custPhone
- (customer, room, startTime) -> endTime
- rateType -> room, hourlyRate
- (room, startTime) -> rateType

Decompose the relational table roomBooking into a minimal number of relational tables in BCNF.

### **Deliverables**

Hand in a printed report, **solution5.pdf**, of a normalization process and explanation of the normalization processes of the above relational tables. Make sure that your report is readable!

### **Submissions**

This assignment is due by 9:00 pm on Sunday, 27 May 2018.

Zip all your solutions (Solution1.xml, Solution2.xml, Solution3.xsd, Solution4.pdf, Solution5.pdf) into a zipped file with a name <YourName\_YourStudentNumber\_A3.zip>. Submit the zipped file through Moodle in the following way:

- (1) Access Moodle at <http://moodle.uowplatform.edu.au/>
- (2) To login use a Login link located in the right upper corner the Web page or in the middle of the bottom of the Web page
- (3) When successfully logged in, select a site CSCI235 (SP218) Database Systems
- (4) Scroll down to a section Submissions of Assignments
- (5) Click at Submit your Assignment 2 here link.
- (6) Click at a button Add Submission
- (7) Move a file, for example, YourName\_A3.zip into an area provided for your submission.
- (8) Click at a button Save changes

- (9) Click at a button Submit assignment
- (10) Click at the checkbox with a text attached: By checking this box, I confirm that this submission is my own work, ... in order to confirm authorship of your submission.
- (11) Click at a button Continue.

**A policy regarding late submissions is included in the subject outline.**

**Only one submission per student is accepted.**

Assignment 3 is an individual assignment and it is expected that all its tasks will be solved individually without any cooperation with the other students. Plagiarism is treated seriously. Students involved will likely receive zero. If you have any doubts, questions, etc. please consult your lecturer or tutor during lab classes or over e-mail.

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*End of specification*