**School:** Computer Science

**Institution:** University of Windsor

**Term:** Winter 2019

**Course:** 03-60-315-1 : Database Management Systems

**Instructor:** Dr. C. I. Ezeife

**Assignment #**1 : Total: 50 marks

**Handed Out:Thurs., Jan. 10, 2019; Due: Thurs., Jan. 24, 2019**

**Objective of Assignment**: To test on knowledge of database concepts and its 3-level architecture necessary for designing databases and their applications as well as practice on use of entity-relationship (ER) model to design databases.

**Scope**: Assignment covers materials from Chapters 1, 2 and 3 of book discussed in class.

**Electronic Assignment Submission:** Done through <http://blackboard.uwindsor.ca>

**Marking Sheme** : The mark for each of the questions is indicated beside each question.

**Academic Integrity Statement**: Remember to submit only work that is yours and include the following confidentiality agreement and statement at the beginning of your assignment.

**CONFIDENTIALITY AGREEMENT & STATEMENT OF HONESTY**

**I confirm that I will keep the content of this assignment/examination confidential.**

**I confirm that I have not received any unauthorized assistance in preparing for or doing this assignment/examination. I confirm knowing that a mark of 0 may be assigned for copied work.**

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Student Signature Student Name (please print)

104535367 24/01/2019

Student I.D. Number Date

**Marking Scheme : The mark for each question and sub question is shown with the question below. Place your solutions in tables provided for answers where possible.**

**For office Use only**

|  |  |
| --- | --- |
| **Question** | **Mark** |
| **1** | **/10** |
| **2** | **/10** |
| **3** | **/10** |
| **4** | **/20** |
| **Total** | **/50** |

**CHAPTER 1: DATABASES AND DATABASE USERS**

1. Given the simple Customer-Subscribesto\_phonecompany database schema which contains three files describing information about telephone company subscribers as follows, answer the following questions with regards to this database. (Total for que 1 is 10 marks)

Customer (SSN: integer, CName: string, Caddress: string, balance: real)

Subscribesto (SSN: integer, CompId: string, phonetype: string, month: string, billamt: real)

PhoneCompany (CompId: string, CompName: string, Address: string, Numproducts:integer)

Note : SSN, CName, Caddress and balance stand for the customer’s social security number, name, address and phone bill balance owing respectively. Also, CompId, phonetype, month and billamt stand for the phone company identifier, the phone type the customer subscribes to, the month of subscription and the phone bill amount for that month. The rest of the attributes are for the company’s name, their address and the number of phone products they provide to customers.

1. Create a valid instance of this database containing values for its records with at least four records in each file. (3 marks)
2. Provide 2 informal English queries for this database with their answers. Each query should involve at least 2 of the files in the database and your answer should indicate the files (e.g., Customer, Subscribesto) needed to answer each query and specify what fields are being retrieved as the result (e.g., CName, balance). Please, provide your solution in the 3 column table below. (4 marks)
3. Specify at least 3 relationships (one for each of the 3 database files) among the records of the database. For each file (e.g., Customer), list any relationships it has with the other files through its fields (e.g., SSN). Provide your solution using the table below.   
    (3 marks)  
   Solution : (10 marks for que 1)

|  |  |  |
| --- | --- | --- |
| Query | Answer | Files involved |
| 1. Create a valid instance of this database containing values for its records with at least four records in each file.   (3 marks) | An instance of the Customer-Subscribesto\_phonecompany database is :  Customer  **SSN CName Caddress Balance**  185-568-968 John Smith 1920 Main St 800$  136-468-962 Mary Beg 156 First Ave 75$  568-862-536 Billy Bob 86 County Rd 20$  235-463-233 Mark Math 901 Third St 425$  Subscribesto **SSN CompID PhoneType Month Billamt**  185-568-968 Bell iPhone Oct 200$  136-468-962 Telus LG June 80$  568-862-536 Rogers Samsung May 65$  235-463-233 Telus Nokia April 100$  Phonecompany  **CompID CompName Address Numprodcucts**  TL Telus 101 Main St 8  BL Bell 123 First Ave 9  RG Rogers 89 Second St 12  WD Wind 56 Seventh Dr 15 |  |
| 2. Provide 2 informal English queries from this database with their answers. Each query should involve at least 2 of the files in the database and your answer should indicate the (e.g., Customer, Subscribesto) needed to answer each query and specify what fields are being retrieved as the result (e.g., CName, balance). (4 marks) | Queries are :  -Query the customers SSN and the phone bill amount for the month  -Query the companies name and customers address  Result of queries are :  -Customer->SSN Subscribesto->billamt  -PhoneCompany->CompName Customer->Caddress |  |
| 3. Specify at least 3 relationships (one for each of the 3 database files) among the records of the database. For each file (e.g.,Customer), list any relationships it has with the other files through its fields (e.g., SSN).  (3 marks) | Customer and Subscribeto with SSN  Subscribeto and PhoneCompany with CompId  PhoneCompany and Customer with address  . |  |

1. Recall that a database has many types of users, each of whom may require a different view of the database. For example, Customer-Subscribesto\_phonecompany database schema of question 1 may be accessing and printing the details and balances owing of each customer frequently and thus a view for this user is created. Another view for this database is checking each uncleared customer’s monthly subscription phone bill amounts sot hey can be added to the balance owing. (Total for que 2 is 10 marks)
2. Using this Customer-Subscribesto\_phonecompany database,give 2 additional views that may be needed by other user groups for the database. (5 marks)

Solution : (5 marks for que 2i)

|  |
| --- |
| - Checking a customers month of subscription to see how many months left in their term.  - Reviewing companies number of products to decide between providers with their options. |

ii) Give 5 examples of integrity constraints that you think can apply to the Customer-Subscribesto\_phonecompany database of question 1. (5 marks)

Solution : (5 marks for que 2ii)

|  |
| --- |
| -Domain Constraints on CompId to ensure type string  -Domain Constraints on billamt to check data type int  -Entity Integrity Constraints in Customer for the SSN requirement  -Key Constraints for Customer and Subscribeto SSN field  -Entity Integrity Constraints in phonecompany CompId requirement |

**CHAPTER 2: DATABASE SYSTEM CONCEPTS AND ARCHITECTURE**

3.a. Design a simple database schema with 4 or less files for a University database system indicating all applicable constraints and information. In this University, students have majors and take courses which they receive grades for. These grades are used to compute the student grade point average at any point in time. As the database designer, you should decide the necessary attributes for students and courses. Also, show a sample database state for the database. (5 marks for a)

b. Using your database, describe the differences between logical and physical data independence.

(5 marks for b)

(Total for que 3 is 10 marks)

|  |  |
| --- | --- |
| Question | Answers |
| 1. Design a simple database schema with 4 or less files for a University database system indicating all applicable constraints and information. Also, show a sample database state for the database.  (5 marks) | `  Students  *StudentId:int Major:string, Minor:string, gpa:float*  Courses  *NumOfCourses:int, MajorAvg:float, gpa:float*  **StudentId Major Minor gpa**  104535367 Computer Science Math 3.2  **NumOfCourses MajorAvg gpa**  6 86 3.2 |
| 1. Using your database, describe the differences between logical and physical data independence | Logical data can change the conceptual schema without having to change the application program itself. Whereas physical data can change the internal schema without altering the conceptual schema. Using my database previously defined, physical data independence would be represented by changing the number of courses taken by a student (this would not cause a change in the conceptual schema) and logical independence would be represented by removing the Minor category from the Student file (causing a direct change to the conceptual schema). |

**CHAPTER 3: DATA MODELING USING THE ENTITY-RELATIONSHIP (ER) MODEL**

4. Windsor Records company has hired you as a database designer. One of your first jobs is to design a conceptual schema for Windsor records and draw an ER diagram for your schema using the following information. The database stores information about musicians who perform on Windsor Records albums and also stores other company data.

i. Each Windsor Records musician has a unique social security number (SSN), a name, an address and a phone number.

ii. Each instrument used in recorded songs has a unique name (e.g., guitar, flute, drum, etc.) and a musical key (e.g., C, B-flat, E-flat).

iii. Each album on their label has a unique album identifier, an album title, a copyright date, a format (eg. CD, vinyl, MP3, etc.).

iv. Each song recorded has a unique song title and an author.

v. Each musician may play several instruments, and a given instrument may be played by several musicians.

vi. Each album has a number of songs on it, but no song may appear on more than one album.

vii. Each song is performed by one or more musicians, and a musician may perform a number of songs.

viii. Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Indicate all key and cardinality constraints and any assumptions that you make.

Design the Entity-Relationship (ER) model diagram for this database.

(Total for que 4 is 20 marks)  
  
(Note : 10 marks for correct entity and relationship identifications with their attributes in the ER diagram. It is 0 with no ER diagram presented).

(5 for entities and 5 for relationships, 5 marks for correct constraints interpretations on the edge labels, 5 marks for correct verbal interpretations of the database being represented by the ER digram through use of correct symbols etc.).

Hint : Present the conceptual design first, showing (1) all the entities and their attributes, (2) all the relationships and their attributes, (3) all the constraints before drawing your ER.

(Total for que 4 is 20 marks) Conceptual information in table and ER diagram next

|  |  |
| --- | --- |
| Specific Requirement/Constraint Type | Requirements and Constraints for the ER diagram |
| Entities and attributes  (5 marks) in ER | MUSICIAN – SSN: int, name: string, address: string, phoneNum: int, instPlayed: arrayString  ALBUM – albumId: string, titleA: string, copyright: string, format: string, songs: int, producer: string  SONG – titleS: string, author: string, instrumentAndKey: arrayString |
| Relationships and attributes  (5 marks) in ER | SONG appearsOn ALBUM – binary  MUSICIAN produces ALBUMs – binary  MUSICIAN performsOn SONG – recursive |
| Interpretation of each of the constraints represented on the edge labels (5 marks) in ER | Binary appearsOn – 1:N  Binary produces – M:N  Recursive performsOn – (0,1) (1,N) |
| Correct use of symbols in ER, etc (5 marks) |  |

**ER Diagram goes next :**

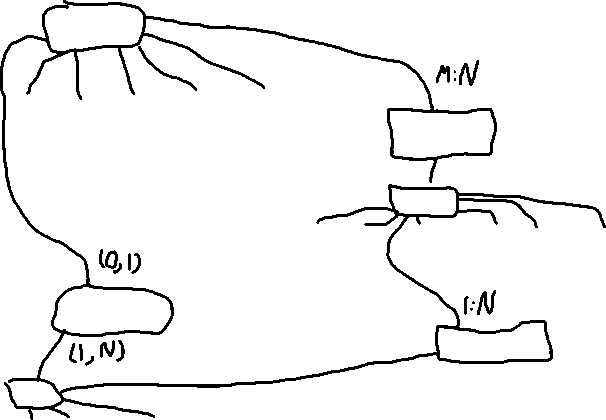
You may attach a scanned copy of your hand-drawn ER diagram here. You can also draw it digitally if possible and attach. Note that in the ER diagram, the foreign key attributes that are part of the relationship schemas are not explicitly listed with the relationship but inherited from the entity the relationships are connected to.

MUSICIAN

SSN Name Address phoneNum instPlayer

PRODUCES

ALBUM



albumId titleA copyright format songs producer

PERFORMSON

APPEARSON

SONG

titleS author instrumentAndKey