**School:** Computer Science

**Institution:** University of Windsor

**Term:** Fall 2021

**Course:** Comp-3150-1 : Database Management Systems

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

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

**Handed Out:Thurs. Sept. 16, 2021; Due: Thurs. Sep. 30, 2021**

**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.**

**For Online Test/Examination in Comp 3150 Fall 2021: (additional rules to be observed):  
1. I confirm that I agree to write this final examination as a closed book examination.**

**2. I confirm that I am the student with the name and student id signed below.**

**3. I confirm that I agree to not send email, chat, text or talk in any way to people other than the instructor or proctoring GA of this course during this examination.**

**4. I confirm that I agree to not engage in copying or cheating during this online examination.**

**\_\_\_\_\_\_** Ravi Trivedi \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ Ravi Trivedi \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Signature Student Name (please print)

\_\_\_\_\_\_\_\_\_\_ 105197609 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ 28th Sept, 2021 \_\_\_\_\_\_\_\_\_\_\_\_

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 Person-vaccinatedin-Centre database schema that contains three files described as follows, answer the following questions with regards to this database. (Total for que 1 is 10 marks)

Person (Ssn: integer, Name: string, Age: integer, jobtype: string)

Vaccinatedin (Ssn: integer, Cntid: integer, vacdate:date, dose: integer, vactime: real)

Centre (Cntid: integer, Cntname: string, city: string, budget: real, managerid: integer)

Note : Ssn, Name, Age, jobtype are the social security number, name, age and job type respectively. Also, Cntid, vacdate, dose and vactime represent centre id, vaccination date (e.g., in dd-mon-yy), which dose (1 or 2) and vaccination time (e.g., 0.00 is 12.00am and 12.00 is 12.00pm at noon). The rest of the attributes Cntname, city, budget and managerid are the centre name (eg. WFCU, St Clair, DownTown, Other), city, budget for running the centre (eg. $80,000) and managerid respectively. A manager is a Person.

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 (not SQL) 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 files (e.g., Person, Vaccinatedin) needed to answer each query and specify what fields (attributes) are being retrieved as the result (e.g., Name, Age). Please, provide your solution in the 3 column table below.

(4 marks)

1. Specify at least 3 relationships (one for each of the 3 database files) among the records of the database. For each file (e.g., Person), list any relationships it has with 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 Person-vaccinatedin-Centre database is :  Person   |  |  |  |  | | --- | --- | --- | --- | | 123 | Ravi | 20 | Developer | | 345 | Abir | 19 | Sales Rep | | 678 | Bingo | 24 | Gamer | | 009 | Marq | 48 | Plumber |   Vaccinatedin   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 123 | 0010 | 24-08-21 | 1 | 08.00am | | 456 | 0011 | 05-04-21 | 2 | 12.05pm | | 678 | 0010 | 30-06-21 | 2 | 9.45am | | 009 | 0013 | 20-12-20 | 2 | 6.30pm |   Centre   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 0010 | WFCU | Windsor | $75000 | 031 | | 0011 | St Clair | Windsor | $25000 | 253 | | 0012 | DownTown | Windsor | $120000 | 504 | | 0013 | WRH | Windsor | $150000 | 988 | | ------ |
| 2. Provide 2 informal English queries (not SQL) 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 files (e.g., Person, Vaccinatedin) needed to answer each query and specify what fields are being retrieved as the result (e.g., Name, Age).  (4 marks)   1. Who hasn’t vaccinated twice ? 2. What center did Ravi chose to get vaccinated ? | Result of query   * Files needed : Person , Vaccinatedin * Attribute : Name     ii.   * Files needed : Person, Vaccinatedin, Center * Attribute : Cntname | (i)  -------    ii --------- |
| 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., Person), list any relationships it has with other files through its fields (e.g., Ssn). (3 marks) | (i) Person file is related to vaccinated through Ssn  (ii) Vaccinatedin is related to Center through Cntid  (iii) Center is related to Person through managerid, because A manager is a Person | (i) ------  (ii)  ------  (iii) ------ |

1. Recall that a database has many types of users, each of whom may require a different view of the database. For example, one user of the Person-vaccinatedin-Centre database of question 1 may be accessing and printing the details and job types of each Person frequently and thus a view for this user is created. Another view for this database is checking that centre has available budget before expenditure such as for buying supplies. (Total for que 2 is 10 marks)
2. Using this Person-vaccinatedin-Centre database,give 2 additional views that may be needed by other user groups for the database. (5 marks)

Solution : (5 marks for que 2i)

|  |
| --- |
| (a) one user of the Person-vaccinatedin-Centre database may be keeping records and details like name, age, profession, etc.. of all the people who has been vaccinated.  (b) one user of the Person-vaccinatedin-Centre database to check which centre has the highest vaccinated rate, people who got vaccinated in a particular day/time. |

ii) Give 5 examples from many of the different types of key, domain, foreign key, entity and semantic integrity constraints that you think can apply to the Person-vaccinatedin-Centre database of question 1. (5 marks)

Solution : (5 marks for que 2ii)

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| --- |
| GA : any 5 of the following can be used.   1. Ssn (Key) 2. CntId (Foreign Key) 3. One can only get vaccinated if he had 0 / 1 dose of vaccine before (semantic IC) 4. Person can get vaccinated to the center already exist (semantic IC) |
|  |

**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) | STUDENT   |  |  |  |  | | --- | --- | --- | --- | | **StudentId** | **Name** | **Major** | **Year** | | 10202923 | Ravi | CS | 3rd | | 11020233 | Abir | Physics | 2nd |   COURSE   |  |  |  |  | | --- | --- | --- | --- | | **CourseId** | **CourseName** | **CreditHrs** | **Dept** | | COMP1400 | Introduction to Algorithm : I | 4 | CS | | MATH1670 | Differencial Calculus | 4 | MATH | | PHY1000 | Introduction to Astronomy | 3 | PHY |   CLASSES   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **ClassNo** | **CourseId** | **Semester** | **Instructor** | **Building** | | 101 | COMP1400 | Winter | Saeed | Odette | | 201 | MATH1670 | Summer | Patel | Toldo | | 301 | COMP1400 | Fall | Wu Chang | Erie | | 304 | MATH1670 | Fall | Parry | Toldo | | 550 | PHY1000 | Fall | Dr. Strange | Dillon Hall |   TAKES   |  |  |  | | --- | --- | --- | | **StudentId** | **ClassNo** | **Grade** | | 10202923 | 301 | A- | | 10202923 | 550 | C+ | | 11020233 | 301 | A | |
| 1. Using your database, describe the differences between logical and physical data independence | Logical data independence   1. Mainly concerned with the structure or changing the data definition 2. It is difficult to retrieving 3. i.g.. adding/modifying/deleting an old/new element to any of the files above (Student, Course, Classes, takes), separating one record into multiple records   Physical data independence:   1. mainly concerned with the storage of the data 2. It is easy to retrieve 3. i.g.. changes in the root location of the file, compression techniques, different data structures or changing the access method |

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

4 You have been hired to design a database for another version of the Vaccination database world and your first job now is to design an ER model for this database using the following description of that world.

i. persons are identified by their SSN and have other attributes as names, ages and job types.

ii. centres are identified by their centre id and have other attributes as centre names, city, budget and manager id.

iii. Each pharmaceutical company is identified by name and has a phone number.

iv. Each vaccine is identified by the vaccine name and it also has attributes for its drug formula and company that made it.

v. Each pharmaceutical company sells only one vaccine type for a price.

vi. Each vaccine is sold by only one pharmaceutical company

vii. A centre could administer one or more vaccines to several persons, and a person could obtain vaccinations from several centres. Each vaccination adminstration has a date time when taken and which dose (e.g., 1 or 2) it is.

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 ER

(5 for entities with attributes and 5 for relationships with attributes), 5 marks for correct cardinality/participation 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.). If all components above are presented with NO ER DIAGRAM, LOSE 15 MARKS.

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 Requrieement/Constraint Type | Requirements and Constraints from the ER diagram |
| Entities and attributes  (5 marks) in ER | Entities : (Attributes)   * person   + Ssn, name(fname, mint, lname), jobtypes, age * centres   + centerId, centerName, city, budget, managerId * pharmaceutical company   + pharmaName, phone-number * vaccine   + vaccineName, drug-formula, company |
| Relationships and attributes  (5 marks) in ER | * Sells   + (pharmaName, vaccineName, price) * Administer   + (centerId, vaccine, persone, date time, dose) |
| Interpretation of each of the constraints represented on the edge labels (5 marks) in ER | An example provided. Give all others   1. Each person can vaccinate in more than one centre 2. A center count administer more than one person 3. Vaccine can’t be sold by more than one company 4. A company cound only sell one type of vaccine 5. A center can administer more than one type of vaccine |
| Correct use of symbols in ER, etc (5 marks) | Show correct use of symbols for attributes, relationships, participations, etc on the ER diagram itself or lose 5 marks. |

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**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.

The ER model Diagram for the Vaccination Database of Question 3 of Assignment 1 is given next.