

GRADED HOMEWORK 1

Maximum Points: 52.5 points for the Group Portion and 35 points for the Individual Portion

Assigned: 9/11/2023

Group Portion Due: 9/18/2023 at 01:30 PM on Canvas

Individual Portion Due: 9/19/2023 at 11:59 PM on Canvas

NOTES:

- No late submission of either the group portion or the individual portion will be accepted.
- Read the submission instructions at the end of this document.
- If you do not work with your group to solve the Group Portion, you will get a zero score for the Group Portion. If you do not submit your Individual Portion, you will get a zero score for the entire homework regardless of the score you got on the Group Portion. Review the "Group Graded Homework Grading Policy" document and the "Graded Homework" section in the syllabus posted on Canvas.
- Academic Integrity: The group portion must be done by your assigned group only; no collaboration with other groups or with anyone else is allowed. The individual portion must be done by you only; no collaboration with anyone (including your group members) is allowed. The use of generative AI tools (including ChatGPT, Bard, Bing Chat, and other AI writing and coding assistants) is not allowed in all the group questions and individual questions, except for those questions where the use of these tools is explicitly required. Violations of any of these rules will be considered academic misconduct and will result in action as specified in the Academic Integrity Code at The University of Oklahoma: <http://www.ou.edu/integrity>. Consult also the following web page for a Student's Guide to Academic Integrity at The University of Oklahoma: <http://www.ou.edu/integrity/students>.

PROBLEM DESCRIPTION:

A travel company that connects people offering lodgings and people looking for lodgings in the US (think of Airbnb analog) wants to create a database to store the data related to its operation. This company expects people to visit its website, register for a user account, and either browse and book one of the available lodgings or offer lodging of their own ready for booking by other users. An initial analysis of the requirements produced the below facts:

- a. When a person creates a user account through the website, the person will be asked to provide his/her name consisting of the first name and last name, date of birth, email address, and one or more phone numbers. The database is also expected to store the age of the user corresponding to

the date of birth provided and the timestamp when the user account was created. A user can be identified by his/her email address.

- b. A user can take on the following roles: a host offering lodgings for booking and/or a guest booking the available lodgings. A host user is required to provide his/her social security number to the company as well as an insurance policy ID purchased through a third-party partner company.
- c. A host user can offer lodging for booking by the guests. The database will store the following information about the lodging provided by the host: type (such as private room, hotel room, house, etc.), maximum occupancy, number of bedrooms, number of beds, number of bathrooms, price per night, and the address consisting of street name, street number, apartment number, city, state and zip code. A unique ID will be generated by the website when the lodging is first offered and will be stored in the database as well.
- d. A host can offer more than one lodging. A lodging, however, must be offered by exactly one host.
- e. When a guest user decides to book a lodging, the database will record the check-in date, check-out date, number of people staying, and booking cost. A guest user can book the same lodging more than once (for different check-in/check-out dates), or even more than one lodging concurrently.
- f. Some bookings may be canceled before guests check-in. When this happens, the database will record the cancelation information consisting of the cancelation date, cancelation reason, and refund amount. More than one booking can be canceled on the same date, for the same reason, and with the same amount of the refund issued. Furthermore, there might be multiple concurrent cancelations for the same booking (due to payment refused, invalid host's insurance, booking withdrawn by the host, etc.), but their reasons will be all different.
- g. A booking which was not canceled and was not free of charge will have payment information associated with it. This information consists of the guest user's credit card number, expiration date, transaction amount, and a timestamp when the transaction occurred. A credit card transaction is associated with a single booking and vice versa.
- h. The travel company or the host user can offer discounts for a particular lodging. The database will store the information about the minimal number of staying nights to qualify for the discount, maximum numbers of nights before check-in when the discount can be offered, and the discount percentage. Each discount is uniquely identified in the database by the combination of those three values. The same discount can be offered for many lodgings, and one lodging can have many types of discounts offered for it.
- i. A user can refer other people to create a user account on the company's website. A new user can only be referred by one existing user. When the new user makes his/her first booking, the referrer will be granted a certain credit amount which the database records.

Group Questions (GQ1-GQ3):

- 1 **GQ1) (6 points):** Create a free ChatGPT account at <https://chat.openai.com> if you do not have one. Using ChatGPT, write your prompts to ask it to describe the concept of Aggregation in an ER diagram (what an Aggregation means and when it should be used), and ask it to give an example of an Aggregation. Show your prompts and the answers (the definition, usage, and example) given by ChatGPT. Then using the definition and usage of an Aggregation in the textbook and in the class lectures as the correct definition and usage, **explain in detail** why the definition, usage, and example given by ChatGPT are correct or incorrect.

GQ2) (40.5 Points): Draw an ER diagram capturing the above database design requirements (a-i). Make sure to draw and properly annotate the entity sets, their attributes, primary keys, relationship sets, cardinality constraints, etc. **Do not draw anything in excess of what is needed to satisfy the database design requirements.**

GQ3) (6 Points): Assume that the following information is added to the above Problem Description: *“A host can review a guest if the guest has ever stayed in the host’s lodging. The database will record the timestamp when the review is made, the number of stars given (1-5), and a review comment.”* How would you express this requirement in the ER diagram for the Group Question GQ2? If you can express it and believe that it changes the ER diagram for the Group Question GQ2, draw the modified part of the ER diagram. If you cannot express it or do not believe it changes the ER diagram for the Group Question GQ2, provide detailed explanations.

Individual Questions (IQ1-IQ5):

After the group portion of the homework is due (see the submission instructions at the end of this homework), each group member will be assigned two questions: the individual question IQ1 and one of the individual questions (IQ2-IQ5) assigned randomly. You must be ready to answer these questions on your own to submit the individual portion of the homework:

IQ1) (15 Points) Using ChatGPT, write your prompts to ask it to describe the concept of Specialization Relationship in an ER diagram (what a Specialization Relationship means and when it should be used) and ask it to give an example of a Specialization Relationship. Show your prompts and the answers (the definition, usage, and example) given by ChatGPT. Then using the definition and usage of a Specialization Relationship in the textbook and in the class lectures as the correct definition and usage, **explain in detail** why the definition, usage, and example given by ChatGPT are correct or incorrect. Then answer whether or not the ER diagram for the Group Question GQ2 has a Specialization Relationship, and if yes, then draw that Specialization Relationship in your answer.

IQ2) (20 Points) Assume that the following information is added to the above Problem Description: *“Each guest user has one membership based on the number of bookings he/she has made. Each membership has a unique type (such as bronze, silver, gold, etc.), a minimum number of bookings qualifying a guest user for the membership, and the discount percentage applied for every future booking.”* How would you express this requirement in the ER diagram for the Group Question GQ2? If you can express it and believe that it changes the ER diagram for the Group Question GQ2, draw the modified part of the ER diagram. If you cannot express it or do not believe it changes the ER diagram for the Group Question GQ2, provide detailed explanations.

IQ3) (20 Points) Assume that the following information is added to the above Problem Description: *“A guest user can write a review about a lodging (even if the guest user has never booked it). The database will record the timestamp of the review submission, the number of given stars (1-5), and the user comment. Many guests can submit reviews for lodging, and guests can submit many reviews.”* How would you express this requirement in the ER diagram for the Group Question GQ2? If you can express it and believe that it changes the ER diagram for the Group Question GQ2, draw the modified part of the ER diagram. If you cannot express it or do not believe it changes the ER diagram for the Group Question GQ2, provide detailed explanations.

IQ4) (20 Points) Assume that the following information is added to the above Problem Description: *“Each host user has to provide one or more records of the host user’s bank account information. The database stores the bank account number, bank routing number, type of account, name of account’s holder, and bank’s name. The combination of the bank routing number and the account number is unique and can only be used by one host user.”* How would you express this requirement in the ER diagram for the Group Question GQ2? If you can express it and believe that it changes the ER diagram for the Group Question GQ2, draw the modified part of the ER diagram. If you cannot express it or do not believe it changes the ER diagram for the Group Question GQ2, provide detailed explanations.

IQ5) (20 Points) Assume that the following information is added to the above Problem Description: *“A lodging may be unavailable for booking for any periods of time for reasons unrelated to bookings by other guest users (such as renovations, use by the host, etc.) The database stores the start date and end date of each of the lodging’s unavailability periods. An unavailability period is not uniquely determined by its start date and end date.”* How would you express this requirement in the ER diagram for the Group Question GQ2? If you can express it and believe that it changes the ER diagram for the Group Question GQ2, draw the modified part of the ER diagram. If you cannot express it or do not believe it changes the ER diagram for the Group Question GQ2, provide detailed explanations.

SUBMISSION INSTRUCTIONS

Group portion:

- All parts of your solutions must be typed (including your ER diagram) (i.e., no hand-written solutions will be accepted). Make sure that your submitted answers are readable; otherwise, they will not be graded, and you will get a zero credit for this assignment. An example of a free tool that you can use to generate ER diagrams is <http://www.diagrams.net>
- Attach to your group solutions of Problems 1 and 2 a cover page that contains the following information:
COURSE: CS/DSA-4513 - DATABASE MANAGEMENT
SECTION: 001
SEMESTER: FALL 2023
INSTRUCTOR: DR. LE GRUENWALD
GROUP NUMBER: <write your group number here>
GROUP MEMBERS: <list the names of all members here>
SCORE:
- Submit the cover page and your solutions for the group portion of Problems 1 and Problem 2 in ONE SINGLE PDF FILE to Canvas (**file name convention:** “Group” followed by your group number followed by “-Graded Homework 1”; **Example:** “Group10-Graded Homework 1”)

Individual portion:

- After the submission deadline of the group portion of this graded homework, and before the submission deadline of the individual portion of this graded homework, you will have to take a quiz on Canvas. The quiz will be open from 3:00 PM, Monday, September 18, 2023 to 11:59 PM, Tuesday, September 19, 2023. The quiz will contain the Individual Question IQ1 and one of the Individual Questions (IQ2-IQ5). **Once you open the quiz, you will have 60 minutes to submit your answers. Only one attempt is allowed.** You will have to upload one PDF document as your answer.

The quiz will also ask you for your feedback on your group members (i.e., the scores you give to each of your group members on the group portion of this graded homework) as outlined in the “Group Graded Homework Grading Policy” document available on Canvas. **If you do not submit your Individual Portion, you will receive a zero score for the entire homework regardless of the score you got on the Group Portion.**