Mid-term Exam - TCSS 445 A - Spring 2023

Time – 1 hour 30 minutes

100 points

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MARKS	
Q - 1 (30 marks)	
Q - 2 (25 marks)	
Q - 3 (30 marks)	
Q - 4 (15 marks)	
Total	

Instructions:

Individual work only.

This examination has 7 pages.

There is a total of 4 questions. Answer all the questions on this paper. Only the first question is of multiple choices. For the remaining ones, you need to provide explanations. Give very **short but precise** answers.

State any assumptions you make.

Work fast and do the easy questions first. Leave some time to review your exam at the end.

The marks for each question are given. Use this to manage your time. Do not spend on a question more minutes than the marks assigned to it. No points will be taken off for incorrect answers (i.e., you might as well guess).

Please write your Name & Student Id on this page before submission.

Good Luck!

Question 1: (10*3 = 30 points)

1. Which of the following is a declarative language used for database management?

C

a) Java
b) Python
c) Relational algebra
d) C++

?

2. What is the purpose of referential integrity constraints in a database?

can be retrieved again   Save
                                         to tell   C

a) To ensure that data entered into the database is of the same format
b) To ensure that each table has a primary key ✗
c) To ensure that related data across tables is consistent and accurate
d) To ensure that data is backed up regularly

3. Which of the following is true about a composite key in a relational database?

a

a) It is an identifier key that is composed of more than one attribute
b) It is a key that describes the composition of a database
c) It is a key that is used to establish a relationship between two tables
d) It is a key that is automatically generated by the database management system

b/d

4. Consider the relation R = (A, B, C, D) with the following functional dependencies:

$$FD1: \ D \rightarrow A$$
$$FD2: \ B \rightarrow C$$

List the Prime attributes for the above relation.

a) A $D \rightarrow A$
b) B $B \rightarrow C$
c) C
d) D

5. The term attribute refers to a _____ of a table.

(handwritten table with columns labeled D, A, B, C)

a) Record
b) Column
c) Attribute
d) Key

(handwritten answer in box: b)

6. All foreign key entries must either be null or reference an existing entry in the _____ key of another table.

(handwritten answer in box: b)

a) candidate
b) primary
c) unique
d) composite

(handwritten answer in box: c)

7. An entity whose existence depends not upon another entity

a) Weak
b) Undefined
c) Strong

8. In a one-to-many relationship, the entity on the many side is called
a) Child

(handwritten answer in box: a)

b) Parent
c) Instance
d) SubType

9. A One to One relationship is also known as a 'Has-A' Relationship

(handwritten answer in box: b)

a) True
b) False

10. Sub-Type Relations are also called _____ Relationships (Mention **ALL** the correct options)

a) One-One
b) One-Many
c) Many-Many
d) IS-A

Question 2: (25points)

Primary key will be highlighted in red.

Design an ER diagram (<u>**underline the Primary Keys**</u>) for an online shopping platform. **(25 points)**

The platform should have entities for Customers, Products, Orders, and Payments. Customers should have attributes including CustomerId, Name, Email, Phone Number, and Shipping Address. Products should have attributes including ProductId, Name, Description, Price, and Stock Quantity. Orders should have attributes including OrderId, CustomerId, Order Date, and Status. Payments should have attributes including PaymentId, OrderId, Payment Date, and Amount.

State your assumptions and relationships between entities. **(10 points)**

Answer:

Customers
- CustomerID
- Name
- Email
- Phone number
- Shipping Address

Platform
- Customers
- Products
- Orders
- Payments

Products
- Product Id
- Name
- Description
- Price
- Stock Quantity

Orders
- PaymentId
- OrderId
- Payment Date
- Amount
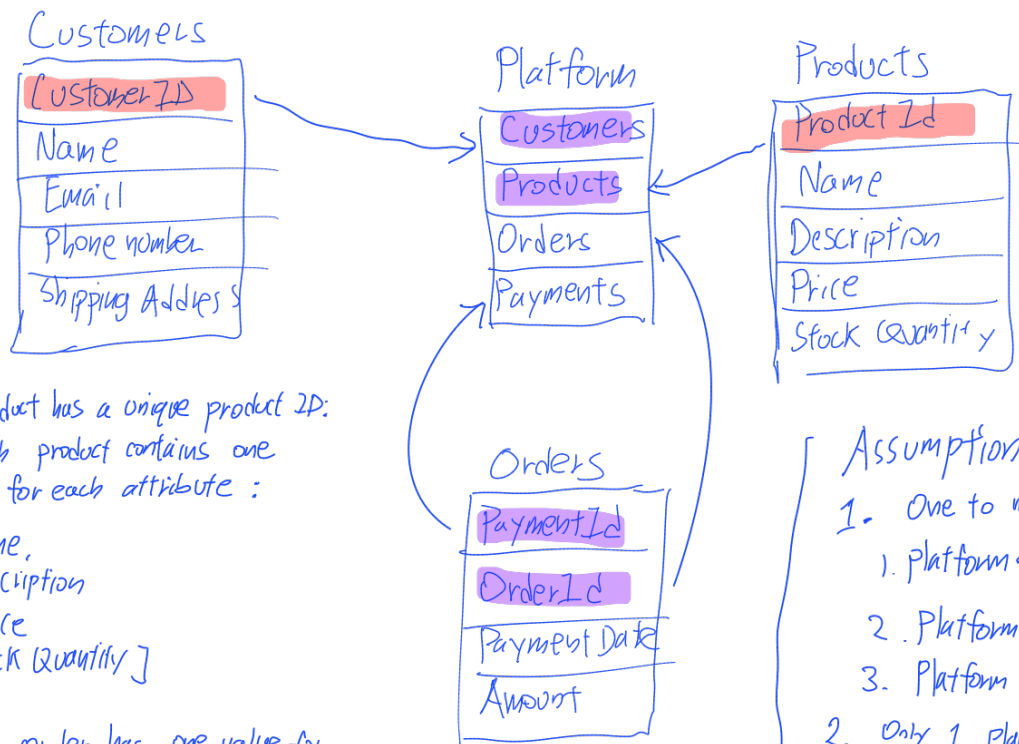
4. Each product has a unique product ID. and each product contains one value for each attribute :

[1.Name,
2. Description
3. Price
4. Stock Quantity]

5. Each order has one value for each attribute:
[1. payment ID
2. OrderID
3. Payment Date
4. Amount].

6. we use the following color for this scheme;

Primary key: ×××
Foreign key: ×××

Assumption:
1. One to many:
   1) Platform ← to - customers
   2. Platform ← to - Products
   3. Platform ← to - Orders
2. Only 1 platform accesses 1 platform database.
3. Each customer has 1 entry for each attributes :
   [· Name
   · Email
   · Phone number
   · Shipping Address]

Question 3: (30 points)

Consolidated is an insurance corporation based in New York. The table below shows the data of a few managers. Without any normalization, all information is stored in one table as shown below. Do you think the table is Normalized? If not represent the 1NF, 2NF, 3NF and 4NF's below and justify

Name	Address	Employees Managed	Designation	Departments
Jeff Sheldrake	Upper west side Manhattan	CC Baxter, Fran Kubelik	Chief Manager	General, General
Joe Dobisch	Brooklyn	CC Baxter	Chief Manager	Sales, Sales
Al Kirkeby	Long Island	Fran Kubelik	Assistant Manager	Administration

Answer: NO.

acronyms: Jeff Sheldrake = J.S   CC Baxter = C.B
Joe Dobish : J.D   Fran Kubelik = F.k
Al Kilkeby : A.K

Employee Relationship

Name	Employees Managed
J.S	C.B
J.S	F.k
J.D	C.B
A.K	F.k

- 3 NF: Removed redundancy

Employee Relationship Table
Can Join General info and
Name table with Name
affinity.

General info

Name	Address	Departments
J.S	Upper west side Manhattan	General
J.D	Brooklyn	Sales
A.K	Long Island	Administration

- Name Table is 1NF
- No duplicate rows.

Name

Name	Designation
J.S	Chief Manager
J.D	Chief Manager
A.K	Assistant Manager

- 3NF: Removed redundancy

Name table follows the
same justification
under the Name Relationship
table.

$A \rightarrow\rightarrow B$
$AB \rightarrow\rightarrow C$
$A \rightarrow D$

$AB \rightarrow E$

Question 4: (15 points)

For each of the following relations schemas and dependencies.

R (A, B, C, D, E) with Multi valued Dependencies A->>B and AB->>C and FD's A->D and AB->E

i.   **Determine all the 4NF violations in this schema.**
Answer: $AB \rightarrow\rightarrow C$,

ii.   **Decompose the relations into a collection of relation schemas in 4NF.**
Answer: $A \rightarrow C$ $B \rightarrow C$,

iii.   **List the final set of relations after decomposition.**
Answer: $\left(A \rightarrow\rightarrow B, \ A \rightarrow D, \ A \rightarrow C, \ B \rightarrow C, \ AB \rightarrow E \right)$

$A \rightarrow B, D \quad \left[\begin{array}{l} A \rightarrow\rightarrow B \\ A \rightarrow D \end{array} \right.$

$AB \rightarrow C, E \quad \left[\begin{array}{l} AB \rightarrow C \\ AB \rightarrow E \end{array} \right.$