FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
SCHOOL OF INFORMATION & COMMUNICATION TECHNOLOGY
DEPARTMENT OF INFORMATION & MEDIA TECHNOLOGY
FIRST SEMESTER EXAMINATION 2018/2019 SESSION
CIT 314: DATABASE CONCEPTS & SYSTEMS

INSTRUCTION: ANSWER THREE (3) QUESTIONS ONLY.

1. a) Explain the following terms briefly: ***(16 marks)***
   - i. *attribute,*
   - ii. *domain,*
   - iii. *entity,*
   - iv. *weak entity set,*
   - v. *aggregation,*
   - vi. *Superkey*
   - vii. *Candidate key*
   - viii. *one-to-many relationship,*

   b) What is a data model? ***(2 marks)***

   c) Differentiate between a database schema and a database instance. ***(2 marks)***

2. a) Explain **five (5)** advantages of using a DBMS instead of simply storing data in operating system files. ***(8 marks)***

   b) When would it make sense not to use a database system? ***(2 marks)***

   c) How does the recovery manager ensure atomicity of transactions? How does it ensure durability? ***(4 marks)***

   d) Give **four (4)** responsibilities of a Database Administrator (DBA) ***(6 marks)***

3. a) What is a transaction? In what ways is it different from an ordinary program in a language such as *C*? ***(4 marks)***

   b) Define the following terms: ***(12 marks)***
   - i. *atomicity,*
   - ii. *consistency,*
   - iii. *isolation,*
   - iv. *durability,*
   - v. *blind write,*
   - vi. *dirty read,*

   c) What is a serializable schedule? ***(2 marks)***

   d) What is a recoverable schedule? ***(2 marks)***

4. a) Consider the SQL query whose resulting table is shown in Figure 1 below. ***(6 marks)***

Sid	Name	Login	Age	Gpa
2011/1/35674CI	Christopher	chris@futminna	19	3.0
2010/1/36782CI	Olufunmi	funmi@futminna	18	4.2
2011/2/32789CI	Maria	maria@futminna	21	1.8

Figure 1: An Instance of the Students Table showing Students with age less than 22

i. Modify this query so that only the login column is included in the answer.

ii. What is the effect of including the clause WHERE S.Gpa >= 2.0 is added to the original query?

iii. Write the Relational Algebra equivalent of the SQL query whose result is shown in Figure 1.

iv. Write the Relational Algebra equivalent of your SQL query in (i) above.

b) Does the relational model, as seen by an SQL query writer, provide physical and logical data independence? Explain. ***(4 marks)***

c) What are the required conditions that must hold for a union operation ($r \cup s$) between two relations r and s to be valid? ***(4 marks)***

d) Explain the statement that relational algebra operators can be composed. Why is the ability to compose operators important? ***(3 marks)***

e) What are Aggregate functions? Give two examples. ***(3 marks)***

5. a) What are Mapping cardinalities? How many mapping cardinalities can you model with an E-R diagram? List them. ***(4 marks)***

b) Explain what the following features of an E-R diagram represent: ***(4 marks)***

i) Dashed Ellipses

ii) Double Lines

iii) Inverted Triangle

iv) Double Diamond

Although you always wanted to be an artist, you ended up being an expert on databases because you love to cook data and you somehow confused database with data baste. Your old love is still there, however, so you set up a database company, ArtBase, that builds a product for art galleries. The core of this product is a database with a schema that captures all the information that galleries need to maintain.

- Galleries keep information about artists, their names (which are unique), birthplaces, age, and style of art.
- For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored.
- Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lifes, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group.
- Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like.

c) Draw the ER diagram for the database capturing all the above mentioned constraints. ***(12 marks)***