

Quiz A

**COMP2411 Database Systems  
Fall 2023**

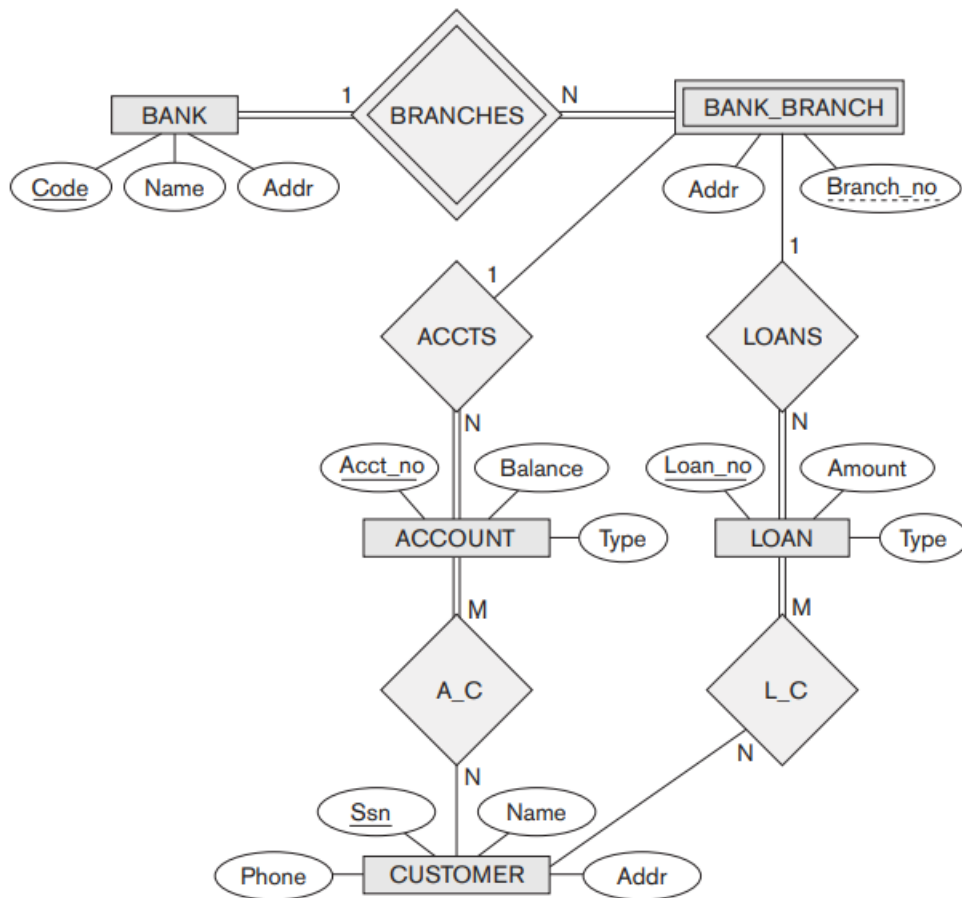
Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

Date: \_\_\_\_\_

*This is a closed book quiz with 15 MC questions and 2 short questions. You have 60 minutes to complete this quiz. For the MC questions, provide your answer inside the brackets at the end of each question. If you think there is more than one answer to a question, select the best one. Each MC question carries 2 marks and the 2 short questions carry 20 marks in total.*

## Quiz A

The ERD below is used for Question 1-6.



1. In the above ERD, which entity is a weak entity? (\_\_\_)

- (a) BANK
- (b) ACCTS
- (c) **BANK\_BRANCH**
- (d) BRANCHES
- (e) ACCOUNT

2. What is a suitable data type for the 'Code' attribute? (\_\_\_)

- (a) DECIMAL
- (b) **CHAR**
- (c) INTEGER
- (d) BOOLEAN
- (e) DATE

Quiz A

**3. How many 1-N relationships in the above ERD? (\_\_\_)**

- (a) 3
- (b) 4
- (c) 5
- (d) 6
- (e) 7

**4. Which of the following statements is FALSE? (\_\_\_)**

- (a) A bank has several branches.
- (b) **Every customer has at least one account.**
- (c) A bank branch may have some loans.
- (d) Some customers share the same account.
- (e) None of the above

**5. In the above ERD, when  $L\_C$  is transformed to a table, what is the number of attributes inside? (\_\_\_)**

- (a) 1
- (b) 2
- (c) 3
- (d) 4
- (e) None of the above

**6. How many foreign keys after the tables generated from the ERD above? (\_\_\_)**

- (a) 4
- (b) 5
- (c) 6
- (d) 7
- (e) None of the above

**7. Logical data independence can be defined as \_\_\_\_\_. (\_\_\_)**

- (a) **The capacity to change the conceptual schema without having to change the external schema.**
- (b) The capacity to change the external schema without having to change the physical schema.
- (c) The capacity to change the physical schema without having to change external schema or application programs
- (d) All of the above
- (e) None of the above

8. An external schema is \_\_\_\_\_. (\_\_\_)

- (a) **A collection of views like relations.**
- (b) A collection of files.
- (c) A physical schema.
- (d) A collection of relations stored in the database.
- (e) None of the above.

9. The HAVING clause does which of the following? (\_\_\_)

- (a) **Acts like a WHERE clause but is used for groups rather than rows.**
- (b) Acts like a WHERE clause but is used for rows rather than columns.
- (c) Acts like a WHERE clause but is used for columns rather than groups.
- (d) Acts EXACTLY like a WHERE clause.
- (e) None of the above

10. An entity (E) has 5 attributes and 3 of them form the composite primary key. The entity has a recursive 1-to-many relationship. How many attributes should there be after transforming the entity (E) to the corresponding table? (\_\_\_)

- (a) 4
- (b) 5
- (c) 6
- (d) 7
- (e) **None of the above**

11. You have run an SQL statement that asked the DBMS to display data in a table named USER\_TABLES. The results include columns of data labeled "TableName," "NumberOfColumns" and "PrimaryKey." You are looking at \_\_\_\_\_. (\_\_\_)

- (a) user data.
- (b) **metadata**
- (c) a report
- (d) indexes
- (e) None of the above

Quiz A

*The following relation BookStore is used in questions 12- 15.*

BookStore								
AuthorID	AuthorName	AuthorPhone	BookNo	Booktitle	Publisher	Edition	Price	PublisherPlace
101	Mary	2017	0001	A	NB	1	100	HK
101	Mary	2017	0004	B	PH	1	40	Kowloon
101	Mary	2017	0004	B	NB	2	80	HK
103	John	2017	0003	V	PH	1	50	Kowloon
103	John	2017	0012	Y	MG	1	45	NT
104	Mary	4029	0005	C	MG	1	50	NT
104	Mary	4029	0005	C	MG	2	60	NT
106	David	3111	0002	F	PH	1	30	Kowloon
106	David	3111	0018	W	NB	1	80	HK
107	Joan	2168	0032	P	NB	1	100	HK
108	Stephen	3145	0023	R	PH	1	75	Kowloon

**12. Which of the following SQL commands will return the AuthorID who have published at least one book? (\_\_\_\_)**

- (a) SELECT AuthorID  
FROM BookStore  
HAVING count(\*)=1
- (b) SELECT AuthorID  
FROM BookStore  
WHERE count(\*) =1
- (c) **SELECT AuthorID  
FROM BookStore**
- (d) SELECT AuthorID  
FROM BookStore  
HAVING count(\*) = 1  
GROUP BY AuthorName
- (e) None of the above

**13. Which of the following SQL commands will return the AuthorName of authors who have the same phone number with another author? (\_\_\_\_)**

- (a) SELECT AuthorName  
FROM BookStore  
WHERE COUNT(AuthorPhone) > 1
- (b) **SELECT A.AuthorName  
FROM BookStore A, BookStore B  
WHERE A.AuthorPhone=B.AuthorPhone AND  
A.AuthorID <> B.AuthorID**
- (c) SELECT AuthorName  
FROM BookStore  
GROUP BY AuthorPhone
- (d) SELECT AuthorName  
FROM BookStore  
WHERE AuthorPhone IN (SELECT \* FROM BookStore)
- (e) None of the above

**14. Which of the following SQL commands will return the publisher of books written by Mary and prices less than 50? (\_\_\_\_)**

- (a) **SELECT DISTINCT Publisher**  
**FROM BookStore A**  
**WHERE A.AuthorName like ”%Mary%” AND**  
**A.Price < 50**
- (b) **SELECT DISTINCT Publisher**  
**FROM BookStore A**  
**WHERE A.AuthorName=”%Mary%” AND**  
**A.Price > 50**
- (c) **SELECT DISTINCT Publisher**  
**FROM BookStore A**  
**WHERE A.AuthorName like ”%Mary%” AND**  
**Count(Price) < 50**
- (d) **SELECT DISTINCT Publisher**  
**FROM BookStore A**  
**WHERE AuthorName IN (SELECT \* FROM BookStore B**  
**B.Price>50 AND B.AuthorName like “%Mary%”)**
- (e) None of the above

**15. Which of the following SQL commands will return the highest price of books with the same title? (\_\_\_\_)**

- (a) **SELECT Booktitle, price**  
**FROM BookStore**  
**WHERE MAX(price)**
- (b) **SELECT Booktitle, max(price)**  
**FROM BookStore**
- (c) **SELECT Booktitle, max(price)**  
**FROM BookStore**  
**GROUP BY price**
- (d) **SELECT Booktitle, max(price)**  
**FROM BookStore**  
**GROUP BY Booktitle**
- (e) None of the above

## Quiz A

### Question 16 (10 marks)

A database schema is given below.

EMPLOYEES(ENO, FNAME, M, INIT, LNAME, BYEAR, SEX, SALARY, DNO)  
DEPARTMENT(DNO, DNAME, MGR\_ENO, ENO)

PLOC are referring to names of cities, such as Hong Kong, Shanghai, etc. DYEAR is in the format of YYYY (integer).

- a) Write an SQL statement that retrieves the first name and birthyear of all employees born in the 50s. [2 marks]

*Ans.*

```
SELECT fname, byear
FROM employees
WHERE 1950 <= byear AND byear <= 1959
```

- b) Write a relational algebra expression that do the same as (a). [1 marks]

$$\Pi_{fname, byear} (\sigma_{1950 \leq byear \wedge byear \leq 1959} (employees))$$

- c) Write a SQL statement to provide the department number for departments only have male employees. [2 marks]

*Ans.*

```
SELECT dno
FROM department
WHERE dno not IN (SELECT distinct dno FROM employees where sex = 'f')
```

- d) Write a relational algebra expression that do the same as (c). [2 marks]

$$\Pi_{dno} (department) - \Pi_{dno} (\sigma_{sex='f'} (employees))$$

- e) For each employee, retrieve the employee number, the department number, and the maximal salary in this department. [3 marks]

*Ans.*

```
SELECT eno, dno, att
FROM employees, (SELECT dno as dno1, MAX (salary) as att
                  FROM employees
                  GROUP BY dno)
WHERE dno = dno1
```

**Question 17 (10 marks)**

You are asked to design a database schema for Utility Services with the information below:

- Customer data include a unique customer number, a name, a billing address, a type (commercial or residential), an applicable rate and a collection (one or more) of meters.
- Meter data include a unique number, an address, a size and a model. A meter is associated with one customer at a time.
- An employee periodically reads each meter on a scheduled date. When a meter is read, a meter-reading document is created containing a unique meter reading number, an employee number, a meter number, a timestamp (including date and time), and a consumption level. When a meter is first placed in service, there are no associated readings for it.
- A rate includes unique rate number, a description, a fixed dollar amount, a consumption threshold, and a variable amount (dollars per cubic foot). Consumption up to the threshold is billed at the fixed amount. Consumption greater than the threshold is billed at the variable amount. Customers are assigned rates using a number of factors such as customer type, address, and adjustment factors. Many customers can be assigned the same rate. Rates are typically proposed months before approved and associated with customers.
- The water utility bills are based on customers' most recent meter readings and applicable rates. A bill consists of a heading part and a list of detail lines. The heading part contains a unique bill number, a customer number, a preparation date, a payment due date, and a date range for the consumption period. Each detail line contains a meter number, a water consumption level, and an amount. The water consumption level is computed by subtracting the consumption levels in the two most recent meter readings. The amount is computed by multiplying the consumption level by the customer's rate.
- 

Design an ERD for the description including entities, their primary keys, relationships, and cardinalities. If the above requirements are not complete, provide yours and state the reasons.

*Suggested Answer.*

*Correct entities and attributes (4 marks), relationships (4 marks), primary keys (2 marks). There are 5 entities (Customer, Meter, Reading, Bill, Rate), relationships (Rate with multiple Customers, Customer has multiple Meters, Customer receives many Bills, Bill has several Readings, and Meter records Readings).*



## Quiz A

Provide your ERD in this page. \_\_\_\_\_

- END OF QUIZ -