MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

TIS3351 – Advanced Database

(All sections / Groups)

25 OCTOBER 2018
2.30 pm – 4.30 pm
(2 hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 pages, including the cover page, with four questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the answer booklet provided.

PART A: ANSWER ALL QUESTIONS [30 marks]

Question 1 [10 marks]

A data warehouse is created to record the daily bank account transaction. The table below shows some sample records in the fact table.

Fact Table – TRANS_LOG

TimeID	TransactionTypeID	CustomerID	BranchID	Transaction Amount	Transaction Fee
11/1/18	W1002	C1001	B1234	200	0.11
11/1/18	W1002	P1002	B1234	100	2.00
14/1/18	D1001	C1001	C1111	200	0.60
16/1/18	D1001	C1001	C1111	100	0
18/1/18	D1001	C1001	N1111	200	0
18/1/18	W1002	P1005	B1234	300	0.11
18/1/18	W1003	P1004	B1234	400	0.60

a) Based on the fact table given above, draw **star schema** for the data warehouse, including the dimension tables. Include all the appropriate attributes in the dimension tables.

[4 marks]

b) Assume that there are 40 records in each of the four dimension tables, calculate the size for the fact table in terms of number of rows.

[1 mark]

c) Calculate also the size for the fact table in terms of bytes. Assume that there are six fields in the fact table with average of five bytes per field. [1 mark]

Continued...

d) The SQL extension for OLAP is GROUP BY for the aggregation functions. Write the SQL commands for (i) GROUP BY ROLLUP, and (ii) GROUP BY CUBE. Then, illustrate with an example on the results retrieved based on the sample data in the TRANS_LOG table for both commands. [4 marks]

Question 2 [10 marks]

a) In the context of distributed database, explain vertical fragmentation. Briefly illustrate it with any example. [2 marks]

b) Draw the object representation for the following business rules: An EMPLOYEE may attend many TRAININGs, while each TRAINING consists of at least five EMPLOYEEs. [3 marks]

c) In the transaction recovery process, if the deferred-write approach is employed, only the transaction log is updated. Identify what will happen during the following scenarios:

(i) if the transaction is committed before checkpoint,

(ii) if the transaction is committed after checkpoint, and

(iii) if the transaction had ROLLBACK operation.

[3 marks]

d) Explain lost update. Illustrate how it may happen using the two transactions below:

Transaction 1: withdraw money from saving account	ACC_BAL = ACC_BAL – 100
Transaction 2: deposit money into saving account	ACC_BAL = ACC_BAL + 500

[2 marks]

Continued...

Question 3 [10 marks]

a) Convert the following PRODUCT table into XML Version 1.0 representation.

[2 marks]

Table name: PRODUCT

PD_No	PD_Description	PD_Type	PD_price
1833	Lava Tumble	Household	12.85
6552	A1 Pencil Case	Stationary	

b) To enforce the security in database, authorization and authentication could be employed.

What is the difference between authorization and authentication? [2 marks]

c) Below are the authorization on table *account* granted to users U_1, U_2, U_3, and U_4:

From DBA:

```
DBA: create role teller
DBA: create role manager

DBA: grant all privileges on account to manager with grant option

DBA: grant select on account to teller
DBA: grant update on account to teller

DBA: grant manager to U1, U2
DBA: grant teller to U3
```

From users U1 and U2:

```
U2: grant all privileges on account to U4
```

Among users U_1, U_2, U_3, and U_4, who can perform delete on table *account* and who can perform update on table *account*?

[3 marks]

Delete : _____

Update : _____

Continued...

d) In order to enable versioning in temporal database, a base table named policy has been created as follows.

```
CREATE TABLE policy (
  id          INT primary key not null,
  vin         VARCHAR(10),
  annual_mileage INT,
  rental_car    CHAR(1),
  coverage_amt  INT,
  sys_start  TIMESTAMP(12) GENERATED ALWAYS AS ROW BEGIN NOT NULL,
  sys_end    TIMESTAMP(12) GENERATED ALWAYS AS ROW END NOT NULL,
  trans_start  TIMESTAMP(12) GENERATED ALWAYS AS TRANSACTION
                              START ID IMPLICITLY HIDDEN,
  PERIOD SYSTEM_TIME (sys_start, sys_end)
);
```

(i) Write the SQL command to create an associated history table named policy_history.

[1 mark]

(ii) Write the SQL command to enable versioning. [2 marks]

Question 4 [10 marks]

a) MongoDB is a document-based NoSQL database, which works on the concept of collection and document. Explain what document-based NoSQL is. [2 marks]

b) One of the features of NoSQL database is it provides high scalability. What is the difference between scaling up and scaling out. [2 marks]

Continued...

c) Suppose you have a collection of **MovieClub** as follows in the MongoDB database. Answer Question 4(i) to 4(iv) based on the collection.

```
{
 "_id" : ObjectId("40d598e597894fb5f92edb92"),
 "first_name" : "Alex",
 "last_name" : "Foong",
 "member_id" : "14556",
 "age_group" : "2",
 "movie" : [
  "I am the Man",
  "Zombie and Alien",
  "The Last Survivor",
  "On the Plane"
 ]
}
```

(i) Write the command to insert the collection into **MovieClub**. [1 mark]

(ii) Find the member that belongs to age group 2 and above. [1 mark]

(iii) Using the update() function, modify the first_name for member with id 14556 to 'Tom'. [2 marks]

(iv) Count the movie watched by each member. [2 marks]

End of Page.