

MODULE CODE	EXAMINER	ACADEMIC UNIT	TEL
CPT103			

1st and 2nd SEMESTER 2023/24 RESIT EXAMINATION

Undergraduate – Year 2

Introduction to Databases

TIME ALLOWED: 2 Hours

INSTRUCTIONS TO CANDIDATES

- 1、 This is a closed book examination.**
- 2、 Total marks available are 100.**
- 3、 Answer all questions.**
- 4、 Answer should be written in the answer booklet(s) provided.**
- 5、 Only English solutions are accepted.**
- 6、 The university approved calculator - Casio FS82ES/83ES can be used.**
- 7、 All materials must be returned to the exam supervisor upon completion of the exam. Failure to do so will be deemed academic misconduct and will be dealt with accordingly.**

Question 1 (25 marks)

Consider the following relations:

cds

cd_id	album	artist
1	Joyland	Andy Mckee
2	Mademoiselle	Berry
3	My Mixed Album	various artists

tracks

track_id	track_name	genre
1	Joyland	acoustic
2	Blue Liquid	acoustic
3	Enfant de salaud	French pop
4	Le bonheur	French pop

tracks_in_cds

track_id	cd_id
1	1
2	1
3	2
4	2
1	3
2	3
4	3

- a) You are given the following SELECT queries. What are the results of application of these queries to the tables above? Provide the answer in a table format. In case that query is not valid, explain the reason. (3 marks each)

1) **SELECT * FROM cds WHERE cd_id != 1;**

cd_id album artist
2 Made... Berry
3 My... Various artists

2) **SELECT sum(track_id + cd_id) FROM tracks_in_cds WHERE cd_id < track_id;**

sum(track_id + cd_id)
21

3) **SELECT track_id FROM tracks_in_cds WHERE cd_id = ALL(SELECT cd_id FROM cds);**

Null

4) **SELECT cd_id, track_id FROM cds RIGHT OUTER JOIN tracks ON (cd_id < track_id) WHERE track_name NOT LIKE '%d';**

cd_id track_id
1 4
2 4
3 4

- b) Write an SQL statement to get all tracks along with their albums. In the result, list track names and album names.

SELECT album, track_name from tracks join tracks_in_cds on tracks.track_id=tracks_in_cds.track_id join cds on tracks_in_cds.cd_id=cds.cd_id; (4 marks)

- c) Write an SQL statement to list all cd tracks whose track names begin with "blue" and end with "d".

SELECT track_name from tracks where track_name LIKE 'blue% d'; (4 marks)



- d) Write an SQL statement to get all albums with more than 3 tracks. The result should list all album names.

(5 marks)
SELECT c.album from cds c left join tracks-in-cds t on c.cd-id = t.cd-id GROUP BY c.album
HAVING count(t-track-id)
> 3;



Question 2 (20 marks)

- a. MySQL does not support INTERSECT and EXCEPT keywords. But these operations can be achieved using SELECT queries. Assume two union compatible tables A (column1) and B (column2). Write down the SELECT statement that achieves A INTERSECT B and A EXCEPT B. From table B).

A INTERSECT B: SELECT column1 from table A inner join table B on column1 = column2; (6 marks)

- (b) Briefly explain what is atomicity in transaction.

(4 marks)

- c. What are the values of the expressions below in the context of 3-valued logic?

1. NOT (True OR Unknown) False
2. False AND Unknown False
3. (12 - 13) OR (NOT Unknown) Unknown
4. (Unknown < 12) > 11 Unknown
5. Unknown = Unknown Unknown

(10 marks)

Question 3 (20 marks)

Normalise the following table "T" into the 3rd Normal Form by clearly describing the normalisation process, i.e., the dependencies removed and how the table is split into sub-tables. Describe the functional dependencies of each resulting sub-table and underline their primary keys.

A	B	C	D	E	F	G	H
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Attributes (A, B, E) form the primary key. In addition, the relation has the following extra functional dependencies:

$B \rightarrow C, D, F$

$C, F \rightarrow D$

$G \rightarrow E$

$C, F \rightarrow F$

2NF: FD $B \rightarrow C, D, F$ is a partial dependence on the primary key (A, B, E) on table T.
after remove it, the table T is splitted into $T_1 (\underline{A, B, E}, G, H)$ with primary key (A, B, E)
 $T_2 (\underline{B}, C, D, F)$ with primary key (B).

3NF: column D is depend transitively via (C, F) on primary key B on table T_2 .
after remove it, the table T_2 is splitted into $T_{2-1} (\underline{B}, C, F)$ with primary key B
 $T_{2-2} (\underline{C, F}, D)$ with primary key (C, F)
FD $C, F \rightarrow F$ and $G \rightarrow E$ is neither partial dependence nor transitive dependence.

Final Design: $T_1 (\underline{A, B, E}, G, H)$

$T_{2-1} (\underline{B}, C, F)$

$T_{2-2} (\underline{C, F}, D)$

Question 4 (35 marks)

You are hired by a restaurant to develop a database for managing the information of dishes, chefs and ingredients. The requirements are listed below:

1. Each dish has a unique dish name, price, spicy level and multiple dish tags.
 - a) The spicy level ranges from 1 to 5.
2. Dish tags can be “vegetable”, “mixed”, “meat”, “halal” and “vegan”.
3. Dishes are cooked using various ingredients. Each type of ingredient has a unique name, storage temperature and max storage time (in days).
 - a) Your database design should record the amount of ingredients (in grams) needed for each dish.
4. Each chef has a staff ID, chef rank and a list of dishes he can cook.
 - a) For simplicity, chef rank should be an integer number between 1 and 8.

Task 1: Draw the entity relationship diagram for the database. All M:N and 1:1 relationships must be properly dealt with. Note that domain constraints are not allowed in this question. (25 marks)

Task 2: Based on your solution to Task 1 above, write the SQL code to create the tables for the database. You should include all the specified attributes and specify the appropriate primary and foreign keys. Minor syntactical errors in your SQL code will not be penalised in the marking of this answer. (10 marks)

END OF RESIT EXAM

