00273

THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF COMPUTER SCIENCE
B.Sc. DEGREE PROGRAMME : LEVEL 04
CPU2241- DATABASE MANAGEMENT SYSTEMS
FINAL EXAMINATION – 2016/2017
DURATION:Three Hours (03 Hours)

Date: 09.08.2017 **Time: 9.30 a.m. – 12.30 p.m.**

Answer FOUR (4) Questions ONLY.

QUESTION 01

1) What is redundant data in a database? Explain it by using an example.

2) Fill in the blanks with appropriate terms.

   a) Dependency of one non-prime attribute on other non-prime attribute is called ..... dependency.

   b) ..... model is concerned with what is represented in the database rather than with how it is represented.

   c) The range of permissible values of a column in a table is called ..... .

   d) A .....key is defined as a key that is used strictly for data retrieval purposes.

   e) ..... table is the implementation of a composite entity.

3) What is de-normalization in database tables?

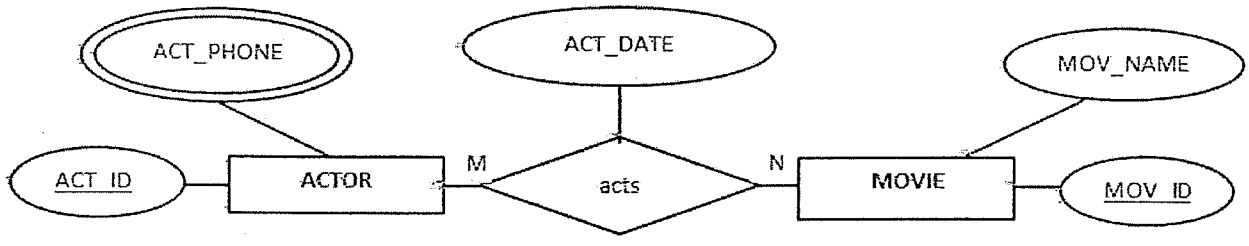
4) What is a database model?

5) What is entity integrity in a database table?

6) What is meant by referential integrity?

7) Describe determination & functional dependence by using an example.

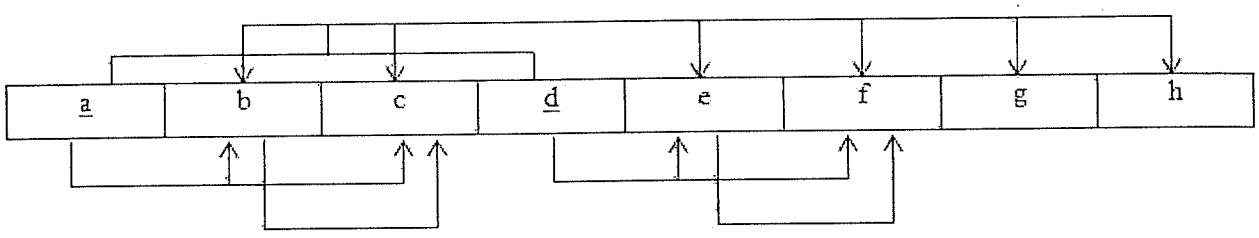
8) Draw the appropriate relational schema for the following ER diagram.



QUESTION 02

1) Describe Data Manipulation Language (DML) and Data Definition Language (DDL).

2) Consider the following diagram.



a) What is the Normal form that this table is currently in?

b) What is "Partial Dependency?" If there are any partial dependencies in the above diagram, identify and mark them.

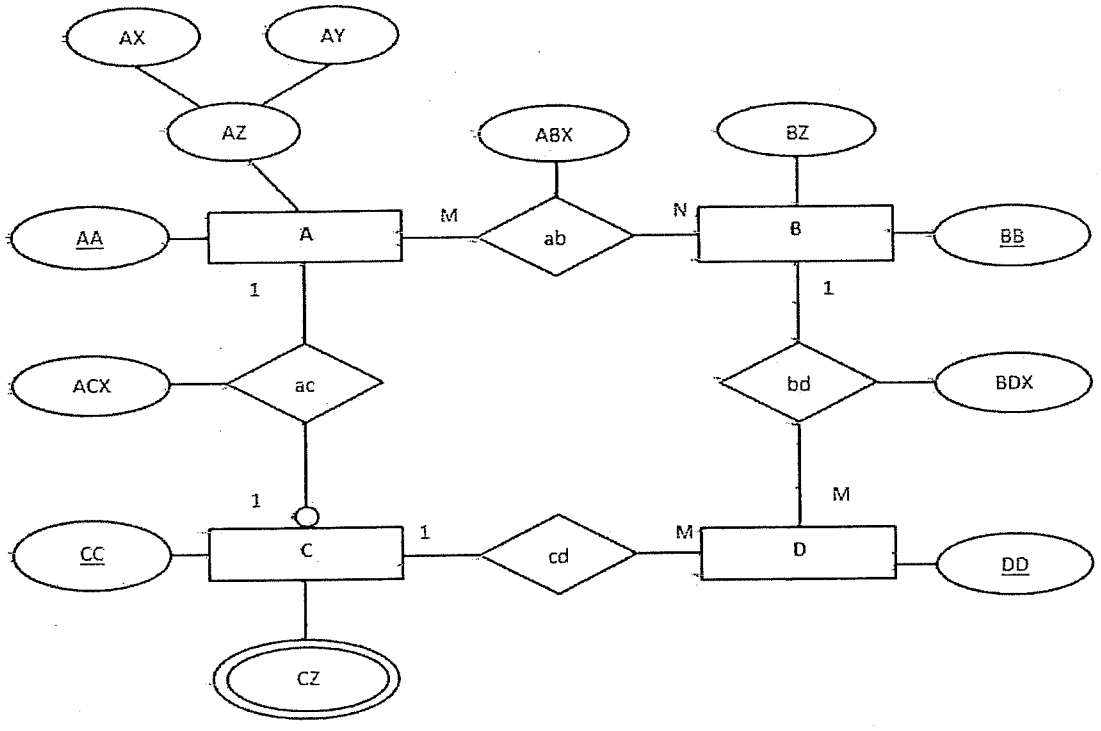
c) What is "Transitive Dependency?" If there are any transitive dependencies in the above diagram, identify and mark them.

d) Normalize this table conform to both Third Normal Form (3NF) and the Boyce-Codd Normal Form (BCNF).

Clearly show the steps (1NF, 2NF, 3NF and BCNF) you follow and mark the primary keys of each decomposed table.

3) What is the difference between TRANSLATE function and REPLACE function?

4) Consider the following ER diagram.



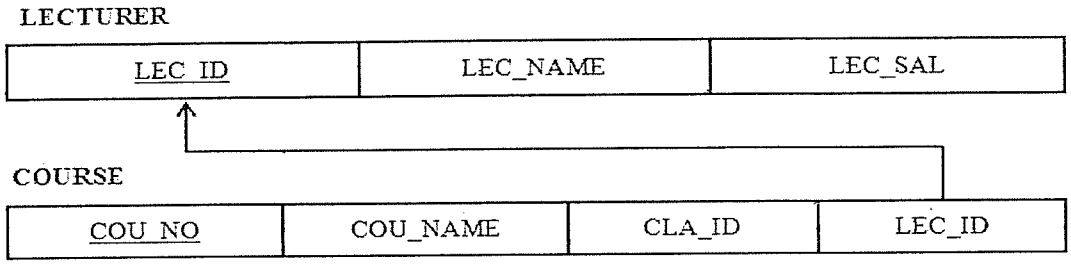
Draw the appropriate relational schema for the given ER diagram.

5) The following shows a part of the relational schema drawn for '**ABC_UNIVERSITY**' database. Create this database and implement the tables on it.

Primary keys should not allow NULL values. Foreign keys should change accordingly on deletions and updates.

LEC_ID, LEC_SAL, COU_NO, CLA_ID: INTEGER

LEC_NAME, COU_NAME: VARCHAR (30)



QUESTION 03

Consider the following tables.

A

SHIRT_SIZE	BRAND
13	EMERALD
14	SIGNATURE
15	LASER
16	EMERALD
17	SPLASH

B

SHIRT_SIZE
13
16

C

DOCTOR_NAME	AGE
SILVA	40
SOYZA	36
LIYANAGE	52
PERERA	44
SIGERA	30

D

DOCTOR_NAME	AGE
LIYANAGE	52
BANDARA	48
SIGERA	30
KUMARAGE	38

E

BRAND	MODEL
OMEGA	CONSTILLATION
CASIO	EDIFICE
SEIKO	ASTRON
CITIZEN	CHANDLER

F

TYPE	STRAP
ANALOG	METAL
DIGITAL	METAL
ANALOG	LEATHER

1) What are the output tables you get, when you apply the following relational database operators to the above tables (A, B, C, D, E and F are table names)?

   a) **A** DIVIDE **B**

   b) **C** DIFFERENCE **D**

   c) **C** INTERSECT **D**

   d) **E** PRODUCT **F**

2) Write suitable SQL queries to do the following tasks.

   a) Select the **DOCTOR_NAME** and **AGE** from **table C**, whose name contains 'i' in any position.

   b) Select the **SIZE**s of **EMERALD** brand from **table A**.

   c) Select the **MODEL**s and character length of the **MODEL**s from **table E**.

   d) Select minimum, maximum and average **AGE** from **table C**.

3)

Consider a hospital system.

The hospital system has hospitals, doctors, patients and wards. Each doctor has an ID to identify the doctor. Apart from that they keep the name and phone number of the doctor.

Each doctor must work in a hospital and each hospital is worked by at least one doctor. Each hospital has an ID to identify it. Apart from that it keeps the hospital name.

Each doctor may treat many patients and each patient must be treated by at least one doctor. Each patient has an ID to identify the patient. Apart from that they keep the patient name and address.

Each patient must admits to a ward and each ward is admitted by at least one patient. Each ward has an ID to identify it. Apart from that it keeps the ward name.

Each hospital must have at least one ward and each ward must belong to one hospital.

Draw the complete ER diagram (use Chen notation).

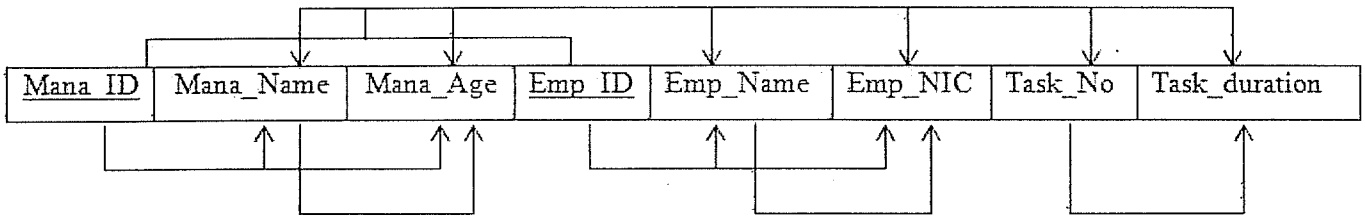
- Show the proper connectivity of the relationships.
- Show the cardinalities of each entity with each relationship.
- Represent the relationship's participation as optional or mandatory.

4) Draw the appropriate relational schema for the above ER diagram drawn for part (3).

QUESTION 04

1) What are table aliases in an **SQL** statement?

2) Consider the following diagram.



a) What is the Normal form that this table is currently in?

b) What is "Partial Dependency"? If there are any partial dependencies in the above diagram, identify and mark them.

c) What is "Transitive Dependency"? If there are any transitive dependencies in the above diagram, identify and mark them.

d) Normalize this table conform to both Third Normal Form (3NF) and the Boyce-Codd Normal Form (BCNF).

Clearly show the steps (1NF, 2NF, 3NF and BCNF) you follow and mark the primary keys of each decomposed table.

3) By looking at the two tables (**DRIVER** and **VEHICLE**) in the '**COMPANY**' database, write the outputs of the following SQL queries.

DRIVER

DRI_ID	DRI_NAME	DRI_AGE	DRI_SAL	VEH_NO
10	sunil kostha	34	35000	1
11	kamal soyza	32	42000	3
12	nimal perera	40	40000	2
13	kumara perera	36	38000	2
14	anil peiris	30	52000	4
15	nuwan kure	28	40000	3

VEHICLE

VEH_NO	VEH_MODEL	NO_OF_PASSENGERS
1	nissan caravan	15
2	toyota hiace	16
3	toyota coaster	25
4	leyland	40

a) SELECT **DRI_NAME** FROM **DRIVER** WHERE **DRI_NAME** LIKE 'k%a';

b) SELECT MIN(**DRI_AGE**) FROM **DRIVER** WHERE EXISTS(SELECT * FROM **VEHICLE** WHERE **NO_OF_PASSENGERS** > 30);

c) SELECT **DRI_ID** FROM **DRIVER** WHERE **DRI_SAL** > ALL (SELECT **DRI_SAL** FROM **DRIVER** WHERE **DRI_AGE** > 32);

d) SELECT **VEH_NO**, COUNT(*) FROM **DRIVER** GROUP BY **1**;

e) SELECT **VEH_MODEL**, TRANSLATE(**VEH_MODEL**, 'an', 'ex') FROM **VEHICLE**;

f) SELECT **DRI_NAME**, INSTR(**DRI_NAME**, 'n') FROM **DRIVER** WHERE **DRI_AGE** < 34;

g) SELECT **VEH_MODEL**, LTRIM(**VEH_MODEL**, 'toyota') FROM **VEHICLE**;

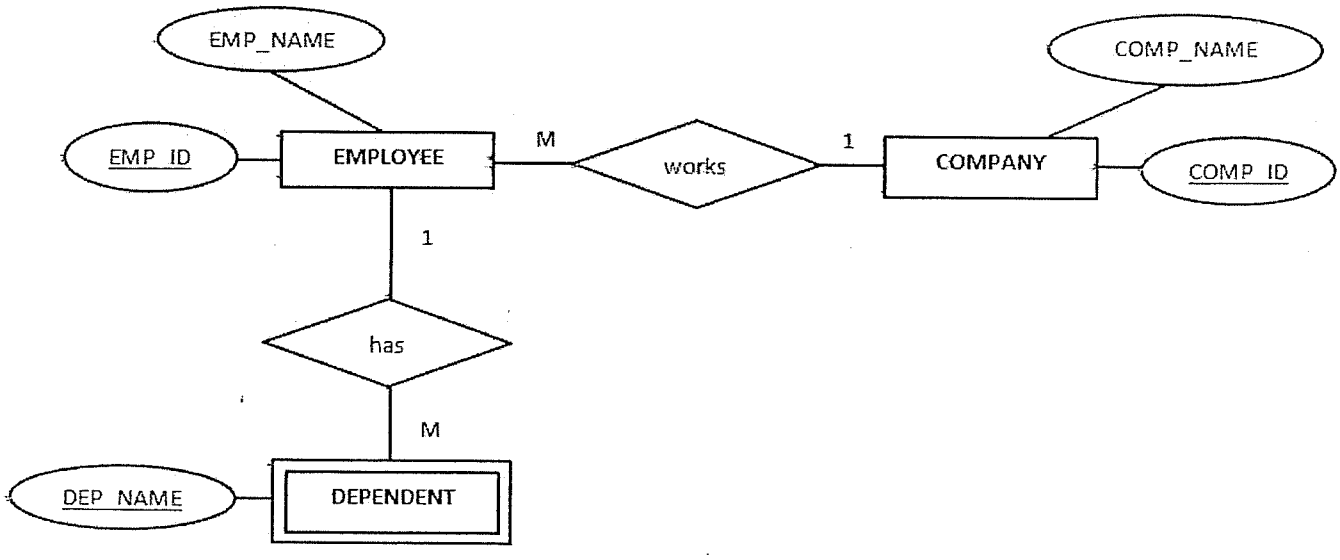
h) SELECT SUBSTRING(**DRI_NAME**,1,5) FROM **DRIVER**;

4) Describe the purpose of '**having**' clause in a **SELECT** statement.

QUESTION 05

1) What is decode function? Explain it with an example.

2) Draw the appropriate relational schema for the following ER diagram.



3) Read the following description.

Professors of **ABC Campus** work on many **research programs**. The table below lists the **no of hours** of each **professor** who worked under several **research programs**.

The **PRO_ID** and the **RES_ID** together uniquely identify the no of hours of each professor under several research programs.

RES_ID	PRO_ID	RES_NAME	NIC	PRO_NAME	DURATION
10	100	Network	641120537V	S.Perera	220
20	110	Economics	701230684V	K.Silva	300
30	100	Management	641120537V	S.Perera	180
10	110	Network	701230684V	K.Silva	150

The attributes have the following functional dependencies.

- RES_ID, PRO_ID → RES_NAME, NIC, PRO_NAME, DURATION
- RES_ID → RES_NAME
- PRO_ID → NIC, PRO_NAME
- NIC → PRO_NAME

a) What is the Normal Form that this table is currently in?

b) If there are any partial dependencies and transitive dependencies, identify and show them.

c) Normalize this table conform to Third Normal Form (3NF).

Clearly show the steps (1NF, 2NF and 3NF) you follow and mark the primary keys of each decomposed table.

d) What is the main requirement of a table to be in Boyce-Codd Normal Form (BCNF)?

e) Are the tables you acquire in part(c) also in BCNF?

QUESTION 06

1) What is the difference between **equi-join** and **natural-join**?

2) Consider a small school system.

   The school has classes, teachers and students. Each class has an ID to identify it. Apart from that it keeps the class type.

   Each teacher has an ID to identify the teacher. Apart from that they keep name and phone number. Each teacher may own one class and each class must owned by one teacher.

   Each student has an ID to identify the student. Apart from that they keep name and address. Each teacher teaches at least one student and each student is taught by at least one teacher.

   Each student must assign to one class and each class is assigned by at least one student.

   Draw the complete ER diagram (use Chen notation)

   - Show the proper connectivity of the relationships.
   - Show the cardinalities of each entity with each relationship.
   - Represent the relationship's participation as optional or mandatory.

3) Draw the appropriate relational schema for the above ER diagram drawn for part (2).

4) Consider the following tables '**Doctor**' and '**Ward**' in a hospital database.

TEA_ID	TEA_Name	TEA_Phone	CLA_ID
10	Thissa	0777120360	1
11	Anula	0779102530	3
12	Janaki	0719122360	2
13	Suren	0729122356	NULL
14	Jagath	0789912632	4

CLA_ID	CLA_Name
1	Mathematics
2	Biology
3	Commerce
4	Arts

   a) Write a statement to modify the **TEA_Phone** into **0777324622** of **TEA_ID 12**.

   b) Use **NATURAL JOIN** operator to join the above two tables.

   c) Draw the resulting table you get after joining the tables.

   d) Write a SQL statement to show all the teacher details, whose names contain the character 'a' in 4th position.