00478

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc/ B. Ed Degree Programme

Department	: Computer Science
Level	: 3/4
Name of the Examination	: Final Examination
Course Code and Title	: CSU3301/CSU4315-Database Design and Implementation CPU2241-Database Management Systems
Academic Year	: 2019/2020
Date	: 21.10.2020
Time	: 1.30 pm-3.30 pm

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **06** questions in **08** pages.
3. Answer any **04** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
6. Involvement in any activity that is considered as an exam offense will lead to punishment
7. Use blue or black ink to answer the questions.
8. Clearly state your index number in your answer script

QUESTION 01

1) State the three main disadvantages of using file system data management.

2) State whether the following statements are **True** or **False**. If **False,** state why.

   a) Any changes made in a database structure are automatically recorded in the data dictionary.

   b) Data Manipulation Language (DML) is the language used to describe the contents of the database.

   c) Conceptual model focuses on the logical nature of the data representation.

   d) In hierarchical model, each parent can have only one child.

   e) Fields qualified to be selected, but not selected as primary key are known as Secondary Keys.

3) Describe both **functional dependence** and **full functional dependence** database concepts.

4) Briefly describe the following terms of a database system.

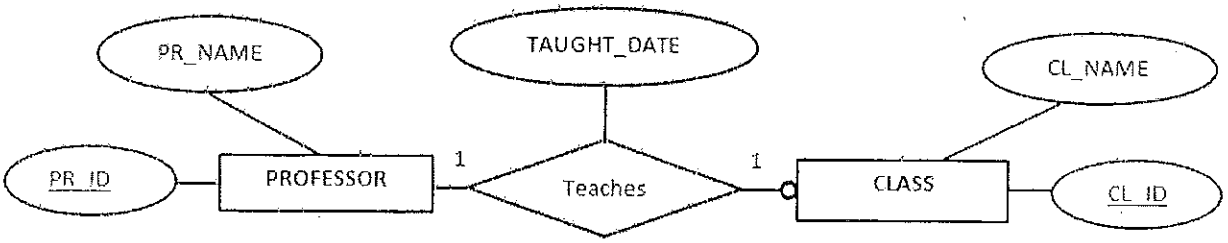
   a) Composite key

   b) Composite attribute

   c) Composite entity

5) What is meant by the **domain** in a relation?

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



QUESTION 02

1) A DBMS can be classified according to the "expected type and extent of use". State the two types of DBMSs under the above classification and briefly describe each DBMS type.

2) Fill in the blanks with appropriate terms.

   a) Information is produced by processing ..... .

   b) ..... is a collection of related records.

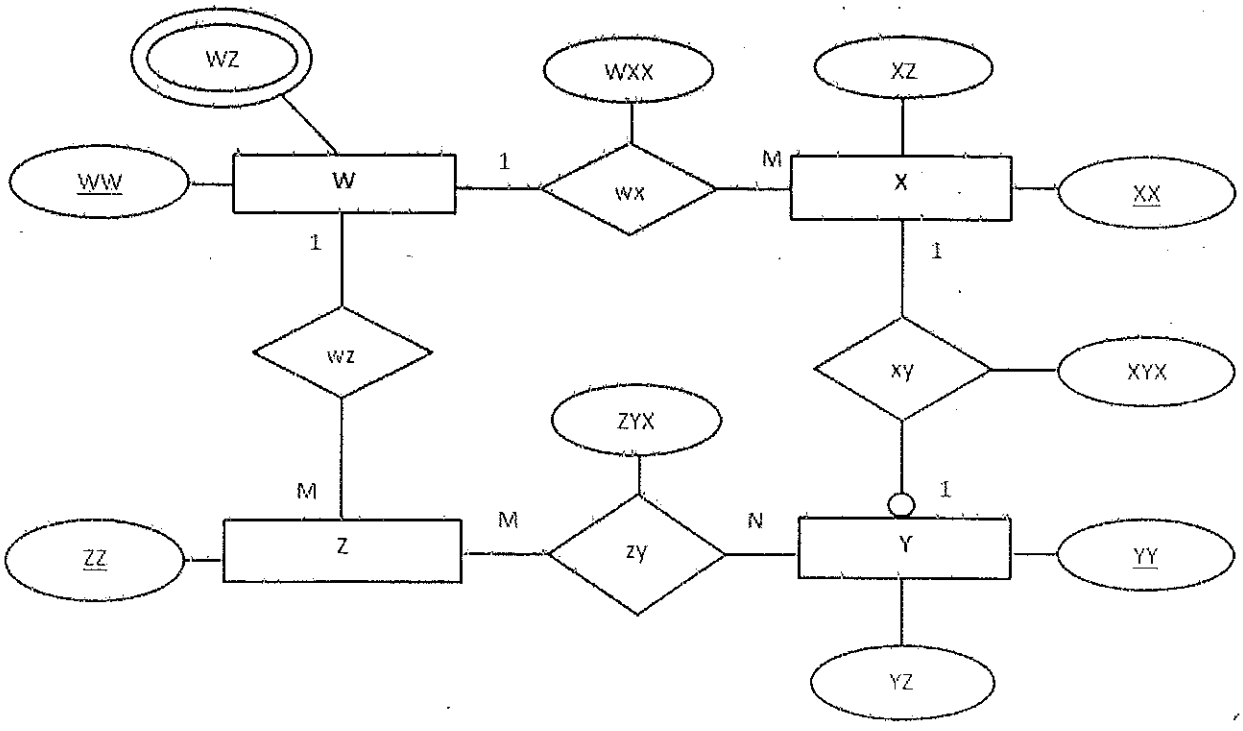
   c) Data ..... is the lack of data integrity.

   d) ..... is the inability to add data to the database due to the absence of other data.

   e) ..... manage the DBMS's use and ensures that the database is functioning properly.

   f) ..... are the instructions and rules that govern the design and use of the database system.

3) Consider the following ER diagram.



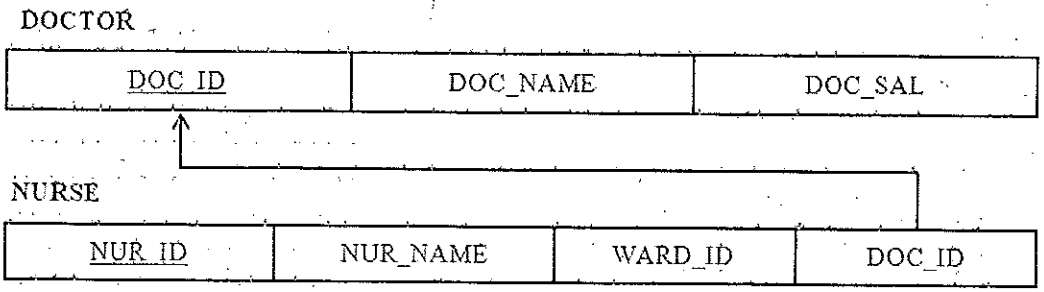
Draw the appropriate relational schema for the given ER diagram.

4) The following shows a part of the relational schema drawn for '**ABC_HOSPITAL**' 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.

DOC_ID, DOC_SAL, NUR_ID, WARD_ID: INTEGER

DOC_NAME, NUR_NAME: VARCHAR (30)



QUESTION 03

Consider the following tables.

A

TV_SIZE	BRAND
32"	SAMSUNG
40"	SONY
42"	LG
55"	SAMSUNG
65"	PANASONIC

B

TV_SIZE
32"
55"

C

LECTURER_NAME	SUBJECT
MANAWADU	SE
PERERA	NW
KARUNARATHNE	DBMS
GUNATHILAKE	CS
SOMARATHNE	DS

D

LECTURER_NAME	SUBJECT
PERERA	NW
GUNATHILAKE	CS
MANAWADU	SE
SOMADASA	EE

E

BRAND	MODEL
SAMSUNG	S10
HUAWEI	P30
SAMSUNG	S20
HUAWEI	P40

F

RAM	BATTERY_POWER
6	3000
8	4000
6	4000

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 BRAND and MODEL from table E, which has the MODEL starting with character 'S'

   b) Select the TV_SIZEs of SAMSUNG brand from table A.

   c) Select the LECTURER_NAMEs and length of the LECTURER_NAMEs from table C.

   d) Select the first two letters of BRANDs from table A.

3) Consider an Army database system.

   The Army has soldiers. Each soldier has an ID to identify them. Apart from that they keep the name and address of the soldier.

   Each soldier must own a rank in the army and each rank is owned by at least one soldier.

   Each rank has an ID to identify it. Apart from that it keeps the rank name.

   Each soldier may (may not) allow official vehicles and each vehicle must be allowed by only one soldier.

   Each soldier may (may not) own a weapon and each weapon must be owned by only one soldier.

   Each vehicle and weapon has an id to identify it. Apart from that it keeps the type.

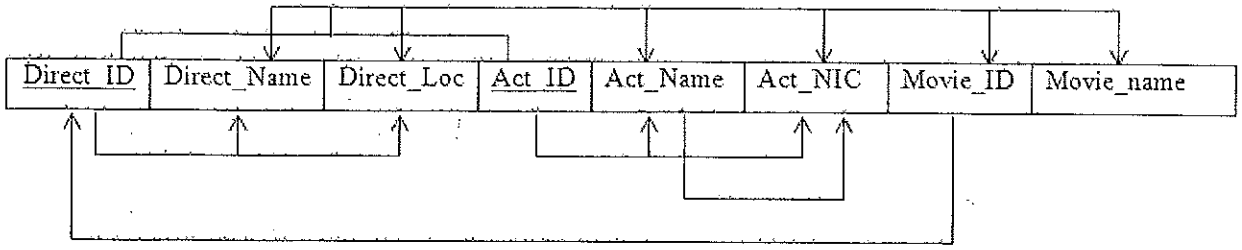
   Draw the complete ER diagram (use Chen notation).

   - 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.

QUESTION 04

1) What is de-normalization?

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 (**LEADER** and **TEAM**) in the '**FOOT BALL**' database, write the outputs of the following SQL queries.

LEADER

LEA_ID	LEA_NAME	LEA_AGE	LEA_SAL	TEA_NO
10	Suneth Perera	28	150000	1
11	Nuwan Soyza	34	145000	3
12	Edward Marks	32	160000	3
13	Sunil Liyanage	46	143000	2
14	Pawan Mallawarachchi	38	155000	1
15	Kasun Weerarathne	35	148000	4

TEAM

TEA_NO	TEA_NAME	LEA_ID	NO_OF_PLAYERS
1	Superheroes	10	11
2	Black Panther	13	10
3	Unicorn	12	08
4	Brave Eagles	15	11

a) SELECT **LEA_ID** FROM **LEADER** WHERE **LEA_NAME** LIKE '%e';

b) SELECT MAX(**LEA_SAL**) FROM **LEADER** WHERE NOT EXISTS(SELECT * FROM **TEAM** WHERE **NO_OF_PLAYERS**> 12);

c) SELECT **LEA_ID** FROM **LEADER** WHERE **LEA_AGE** > ANY (SELECT **LEA_AGE** FROM **LEADER** WHERE **LEA_SAL** > 145000);

d) SELECT **TEA_NO**, COUNT(*) FROM **LEADER** GROUP BY **TEA_NO**;

e) SELECT **LEA_NAME**, REPLACE(**LEA_NAME**, 'a', 'o') FROM **LEADER**;

f) SELECT **TEA_NAME**, INSTR(**TEA_NAME**, 'a') FROM **TEAM** WHERE **NO_OF_PLAYERS** < 11;

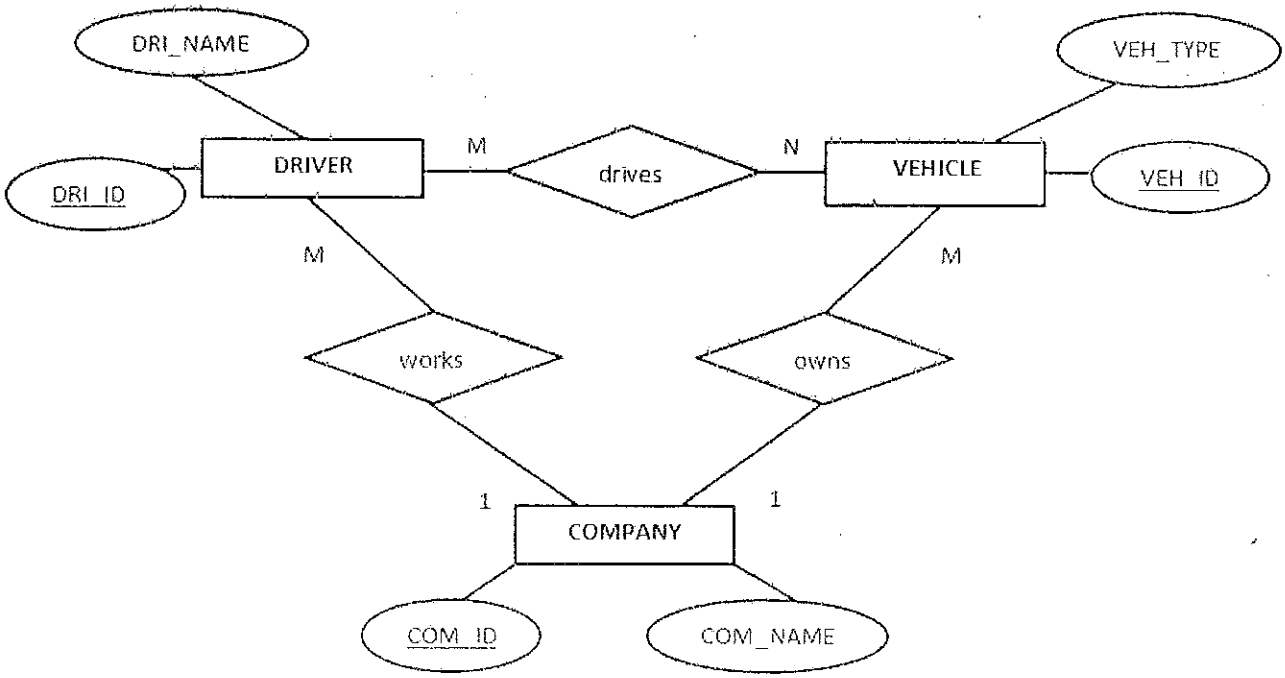
g) SELECT SUBSTRING(**TEA_NAME**, 1, 4) FROM **TEAM**;

h) SELECT **LEA_NAME**, LENGTH(**LEA_NAME**) FROM **LEADER**;

QUESTION 05

1) State the difference between **TRANSLATE** and **REPLACE** functions.

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



3) Consider the following scenario.

Drivers of ABC construction company work on many sites. The table below lists the no of hours of each driver who worked under several sites.

The **SITE_ID** and the **DRI_ID** together uniquely identify the no of hours of each driver under several sites.

SITE_ID	DRI_ID	SITE_NAME	DRI_NAME	DRI_AGE	VEH_NO	DURATION
1	100	GALLE	G.Somadasa	42	PK-5423	180
2	200	JAFFNA	H.Liyanage	54	PD-8756	160
1	200	GALLE	H.Liyanage	54	PD-8756	60
2	100	JAFFNA	G.Somadasa	42	PK-5423	120

The attributes have the following functional dependencies.

- SITE_ID, DRI_ID → SITE_NAME, DRI_NAME, DRI_AGE, VEH_NO, DURATION
- SITE_ID → SITE_NAME
- DRI_ID → DRI_NAME, DRI_AGE
- DRI_NAME → DRI_AGE
- VEH_NO → DRI_ID

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) and the Boyce-Codd Normal Form (BCNF).

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

QUESTION 06

1) What is Data Control Language (DCL)?

2) Consider a small Education system.

The system has schools, teachers and students. Each school has an ID to identify it. Apart from that, it keeps the school name.

Each teacher has an ID to identify them. Apart from that, they keep name and phone number. Each teacher works on only one school and each school is worked by at least one teacher.

Each student has an ID to identify them. Apart from that, they keep the name and address. Each teacher may (may not) teach students and each student is taught by at least one teacher.

Each student must attend to a school and each school is attended 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) Consider the following tables '**STUDENT**' and '**SCHOOL**' in the **EDUCATION** database

STU_ID	STU_Name	STU_AGE	SCH_ID
10	Ruvini	16	1
20	Asiri	14	2
30	Sanka	15	3
40	Ravi	12	2

SCH_ID	SCH_NAME
1	Vishaka
2	Royal
3	Ananda

a) Write a statement to modify the **STU_AGE** into 10 of **STU_ID** 40.

b) Use **INNER 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 student details, whose names end with the character 'i'.

e) Write a SQL statement to show the average age, minimum age and maximum age of students and group them according to the **SCH_ID.**