

THE OPEN UNIVERSITY OF SRI LANKA  
 DEPARTMENT OF COMPUTER SCIENCE  
 B.Sc. DEGREE PROGRAMME : LEVEL 04  
 CPU2241- DATABASE MANAGEMENT SYSTEMS  
 FINAL EXAMINATION – 2017/2018  
 DURATION: Three Hours (03 Hours)



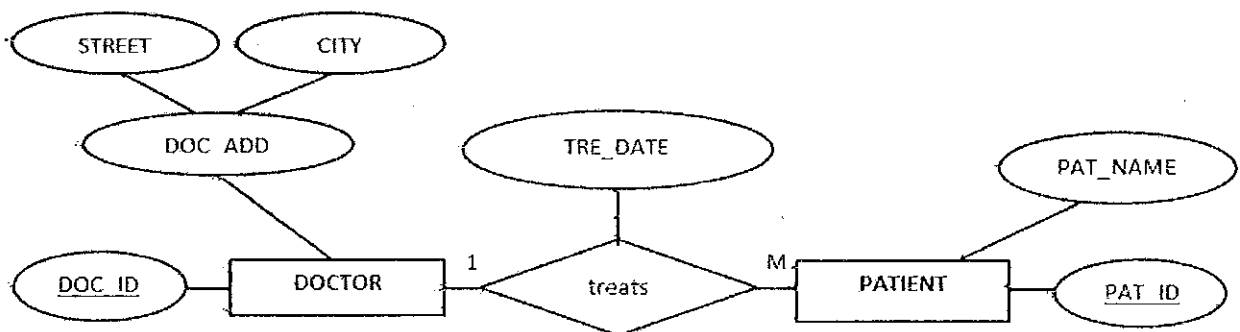
Date: 05.10.2018

Time: 9.30 a.m. – 12.30 p.m.

Answer FOUR (4) Questions ONLY.

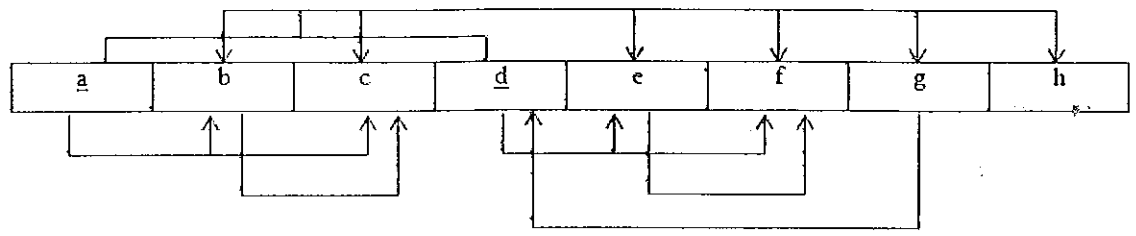
**QUESTION 01**

- 1) Briefly describe the difference between **data** and **information**.
- 2) What is **data management**?
- 3) What is a **database**?
- 4) What is **metadata**?
- 5) Describe the following with respect to **databases**.
  - a) Field
  - b) Record
  - c) File
- 6) What is a **database management system (DBMS)**?
- 7) What is a **database system**?
- 8) What is **redundant data**?
- 9) What are the **three main disadvantages** of a **file system** over a **database management system**?
- 10) What are the **three main anomalies** in a **file system**?
- 11) What are the **five major parts** of a **database system**?
- 12) Draw the appropriate relational schema for the following ER diagram.



**QUESTION 02**

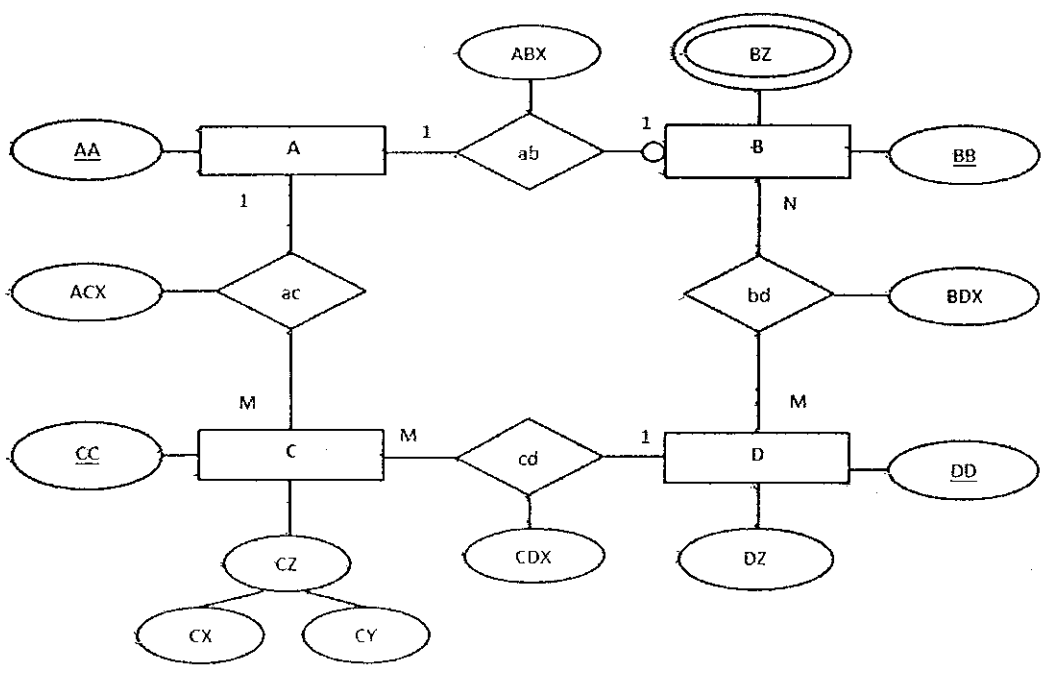
- 1) State the **three** types of **software** needed to make a database system function fully, and describe each of them briefly.
- 2) Consider the following diagram.



- 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 are the **five** types of **users** in a database system? Briefly describe the tasks of them.
- 4) Consider the following ER diagram.



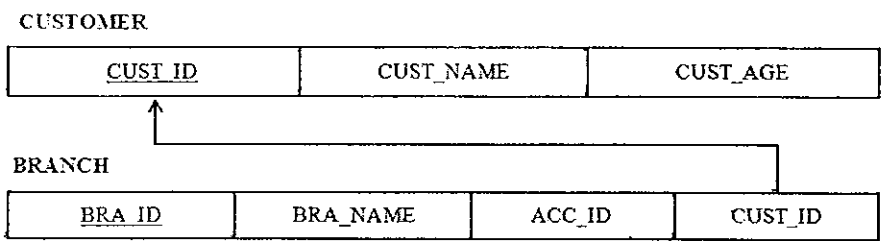
Draw the appropriate relational schema for the given ER diagram.

5) The following shows a part of the relational schema drawn for 'ABC\_BANK' 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.

CUST\_ID, CUST\_AGE, BRA\_ID, ACC\_ID: INTEGER

CUST\_NAME, BRA\_NAME: VARCHAR (30)



**QUESTION 03**

Consider the following tables.

**A**

SHOE_SIZE	BRAND
39	DSI
40	BATA
41	BETTANS
42	DSI
43	PUMA

**B**

SHOE_SIZE
39
42

**C**

VEHICLE	WHEELS
CAR	04
VAN	04
LORRY	06
BUS	06
TIPPER	10

**D**

VEHICLE	WHEELS
CAR	04
JEEP	04
LORRY	06
BIKE	02

**E**

BRAND	COUNTRY
PARKER	USA
DIPLOMAT	GERMANY
SHEAFFER	USA
AURORA	ITALY

**F**

TYPE	COLOR
INK	BLACK
CARBON	SILVER
INK	GOLD

- 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 **VEHICLE** and **WHEELS** from **table C**, in which the vehicle name contains character 'A' in second position.
  - b) Select the **SHOE\_SIZES** of **BETTANS** brand from **table A**.
  - c) Select the **BRANDS** and character length of the **BRANDS** from **table E**.
  - d) Select minimum, maximum and average **WHEELS** from **table C**.
- 3)

Consider a banking system.

The banking system has branches, employees, customers and accounts. Each employee has an ID to identify him. Apart from that they keep the name and phone number of each employee.

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

Each employee services many customers and each customer must be serviced by at least one employee. Each customer has an ID to identify him. Apart from that they keep the customer name and address.

Each customer may maintain many accounts and each account is maintained by only one customer. Each account has an ID to identify it. Apart from that it keeps the account type.

Each branch must have at least one account and each account must belong to one branch.

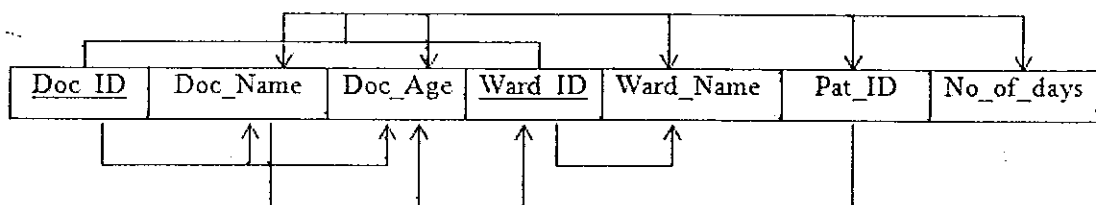
Draw the complete ER diagram (use Chen notation).

- 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 the two types of Database Management Systems (DBMS) according to the classification of 'database site locations'? Briefly explain each DBMS type.
- 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 (**DOCTOR** and **WARD**) in the 'HOSPITAL' database, write the outputs of the following SQL queries.

**DOCTOR**

DOC_ID	DOC_NAME	DOC_AGE	DOC_SAL	WARD_NO
100	sunil perera	45	450000	2
101	nuwan silva	34	350000	1
102	saman soyza	38	375000	3
103	ravin perera	48	480000	4
104	sarath kure	56	360000	3
105	nalaka kostha	30	420000	1

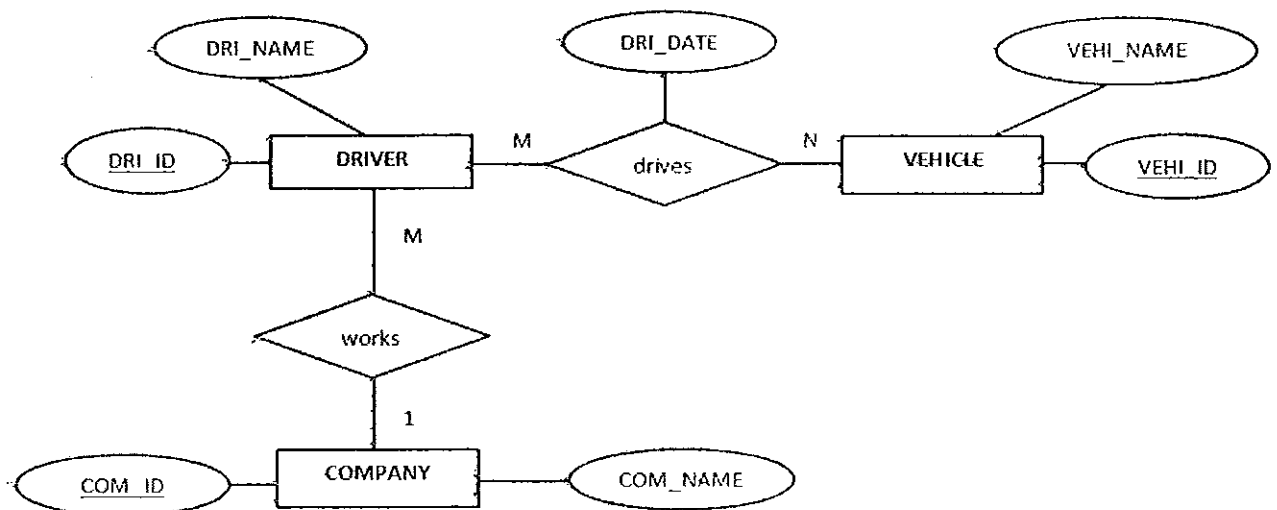
**WARD**

WARD_ID	WARD_NAME	NO_OF_PATIENTS
1	cardiology	80
2	neurology	110
3	oncology	130
4	gynecology	70

- a) SELECT DOC\_NAME FROM DOCTOR WHERE DOC\_NAME LIKE '\_a%a';
- b) SELECT MIN(DOC\_SAL) FROM DOCTOR WHERE EXISTS( SELECT \* FROM WARD WHERE NO\_OF\_PATIENTS > 120);
- c) SELECT DOC\_ID FROM DOCTOR WHERE DOC\_SAL > ANY ( SELECT DOC\_SAL FROM DOCTOR WHERE DOC\_AGE > 40);
- d) SELECT WARD\_ID, COUNT(\*) FROM DOCTOR GROUP BY 1;
- e) SELECT DOC\_NAME, TRANSLATE(DOC\_NAME, 'ra', 'le') FROM DOCTOR;
- f) SELECT WARD\_NAME, INSTR(WARD\_NAME, 'o') FROM WARD WHERE NO\_OF\_PATIENTS > 70;
- g) SELECT DOC\_NAME, LTRIM(DOC\_NAME, 'sa') FROM DOCTOR;
- h) SELECT SUBSTRING(WARD\_NAME,2,4) FROM WARD;
- 4) What are the six Database Management Systems-(DBMS)-components? Briefly describe each of them.

### QUESTION 05

- 1) What are the two main categories of **database models**? Briefly describe them and give two examples for each database model.
- 2) Draw the appropriate **relational schema** for the following ER diagram.



3) Read the following description.

Teachers of ABC\_SCHOOL teach their own courses. The table below lists the **duration** and the **class** of each **teacher**.

The **COU\_ID** and the **TEA\_ID** together uniquely identify the **DURATION** and **CLA\_ID** of each **teacher**.

COU_ID	TEA_ID	COU_NAME	NIC	TEA_NAME	CLA_ID	DURATION
10	110	maths	841125537V	T.Perera	1	2
20	120	english	701230684V	K.Soyza	2	3
30	130	chemistry	641120537V	H.Silva	3	1
40	140	physics	761231584V	G.Kure	4	3

The attributes have the following functional dependencies.

- $COU\_ID, TEA\_ID \rightarrow COU\_NAME, NIC, TEA\_NAME, CLA\_ID, DURATION$
  - $COU\_ID \rightarrow COU\_NAME$
  - $TEA\_ID \rightarrow NIC, TEA\_NAME$
  - $NIC \rightarrow TEA\_NAME$
  - $CLA\_ID \rightarrow TEA\_ID$
- 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).  
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?
  - f) If the tables you acquire in part(c) are not in BCNF, normalize the tables conform to BCNF.

**QUESTION 06**

- 1) State the difference between **TRANSLATE** and **REPLACE** functions?
- 2) Consider a company system.

The company has departments, employees and projects. Each department has an ID to identify it. Apart from that it keeps the department name.

Each employee has an ID to identify him. Apart from that they keep name and address. Each employee works for one department and each department is worked by many employees.

Each project has an ID to identify it. Apart from that it keeps the project name. Each department maintains at least one project and each project is maintained by only one department.

Each employee may assign for many projects and each project is assigned by at least one employee.

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 'EMPLOYEE' and 'DEPARTMENT' in a company database.

EMP_ID	EMP_Name	EMP_Age	DEP_ID
100	Sujith	42	1
101	Jayantha	38	4
102	Kalum	45	2
103	Sadun	34	1
104	Sugath	28	3

DEP_ID	DEP_Name
1	IT
2	Sales
3	Finance
4	Production

- a) Write a statement to modify the **EMP\_Age** into **38** of **EMP\_ID 104**.
- b) Use **EQUI 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 employee details, whose names contain the character 'u' in 2<sup>nd</sup> position and whose age is greater than 40.