University of Ruhuna - Faculty of Technology

Bachelor of Information & Communication Technology Degree

Level 1 (Semester 2) Examination

April 2019

Course Unit: ICT1213, Database Management Systems

Time Allowed: 02 hours

This question paper contains **05 pages** including this instruction page.

IMPORTANT INSTRUCTIONS:

1. The medium of this examination is **English.**
2. This is a **Closed Book** examination.
3. This Examination consists of **four (04)** questions that are given equal marks.
4. You must **answer all four (04) questions** in this examination.

Question 01

(a) Draw an Entity Relationship (ER) Diagram that captures the following requirements by indicating relevant attributes along with the primary keys. Also specify cardinality and participation constraints: State any assumptions you have made.

A student of "Faculty of Technology" wants to build a "TV Series Episode Guide" website. Then, the student has conducted a survey to identify the requirements of it's backend and found the findings given below.

There are number of Studios (Ex: Disney, Warner, Marvell, etc.) that produce TV series and each Studio has a name, address and a unique web address.

A Studio may produce many TV series but for a given TV series there is only one producing studio. Each TV series has a starting date, ending date, title, creator and a broadcaster which broadcast the TV series. A TV series cannot be identified by using only title because same titles can be created by different creators.

A TV series has many episodes as well as many characters. Both episodes and characters are associated with TV series and existence of both episodes and characters depending on the series that they belong to. An episode has episode id, air date, title and rating. Same episode id can be seen in multiple series, but for a given TV series episode id is unique. Each Character has a name and a role. Same character can be seen in multiple series, but for a given TV series character name is unique. Characters are featuring in episodes and an episode may have many characters.

Actors are performing in TV series and they have a unique actor id and a name. There can be many actors in a series, and an actor can perform in many different series as well. An actor can play multiple characters and a character can be played by multiple actors.

(b) Map the ER diagram you obtained in (a) into a set of relations. Specify all primary keys and foreign keys of each relation.

Question 02

Consider the following relations for the Out-Patient Department (OPD) database in a hospital. Answer the following questions using the given schema.

```
Doctor(DocID, DName, Specialty, Contact)
Patient(RegNo, PName, Address, Age, PrimaryDocID)
Prescription(pressID, Date, IssuedDocID, PatientRegNo)
Guardian(GuardID, GName, Contact, Address, PatientRegNo)
```

(a) Express the following queries in **Relational Algebra.**

(i) List the RegNos, names and addresses of all patients older than 60 years.

(ii) List the names of patients whose primary doctor's name is "Lal Kularathna".

(iii) List the names of doctors who are not primary doctors to any patient.

(iv) List RegNos and names of patients who have no prescriptions written by doctors other than their primary doctors.

(b) Express the following queries **Tuple Relational Calculus.**

(i) List the names of doctors who are "Dermatology" specialists.

(ii) List the names of patients who are NOT having guardians.

(c) Express the following queries **Domain Relational Calculus.**

(i) List the PressIds of all the prescriptions which are issued on "01 January 2018".

(ii) List the names and addresses of all patients whose Guardian name is "Suneth Kumara".

Question 03

Faculty of Technology wants to create a database to maintain their academic employee details. A sample of data set for two academics is given below.

AcademicID : A03	**FName** : Nimal	**Title** : Senior Lecturer
DepartmentID : D01	**DepartmentName** : ICT	

QualificationID	**Description**	**Level**	**Year**
1	BSc	Undergraduate	2008
2	MSc	Postgraduate	2011
3	PhD	Postgraduate	2016

AcademicID : A20	**FName** : Aruni	**Title** : Lecturer
DepartmentID : D02	**DepartmentName** : ET	

QualificationID	**Description**	**Level**	**Year**
1	BSc	Undergraduate	2015

The representation of above data is as follows:

```
Academic(AcaID, Fname, Title, DepID, DepName, QuaID,
Description, Level, Year)
```

(a) Using above example, briefly describe the three (03) types of update anomalies.

(b) (i) List down 03 Functional Dependencies you have identified in above "Academic" relation.

(ii) Normalize given above relation into third normal form (3NF). Show your intermediate steps.

Question 04

(a) List down two (02) advantages and two (02) disadvantages of using Views.

(b) Describe the followings:

(i) Program-Data Independence

(ii) Program - Operation Independence

(c) (i) Describe briefly Referential Integrity Constraint in the context of relational databases.

(ii) Using examples briefly describe the effect of the referential integrity for the following options with respect to the DELETE.

- SETNULL
- CASCADE
- RESTRICT

(d) Briefly describe the following terms in database.

(i) Hierarchical Model

(ii) Data Integrity

(iii) Derived Attribute

(iv) Transitive Dependency

(v) Composite Key

*****END*****