



Sri Lanka Institute of Information Technology

B.Sc. Honors Degree in Information Technology

Final Examination  
Year 1, Semester II (2019)  
June Intake

IT1090 – Information Systems and Data Modeling

Duration: 2 Hours

May 2019

Instructions to Candidates:

- ◆ This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.
- ◆ This paper has 4 questions.
- ◆ Answer all questions in the booklet given.
- ◆ The total marks for the paper is 100.
- ◆ This paper contains 6 pages, including the cover page.
- ◆ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

## Question 1

**[Total: 25 Marks]**

- a) “Information systems (IS) are formal, technological, organizational systems designed to collect, process, store, and distribute information”.

Assume that you are been hired to develop an attendance management system using biometric identifiers to a Creative Garments Pvt. Ltd factory located in Biyagama Export Processing Zone with over 300 machine operators working for eight hours shifts.

- i. Identify the components of the proposed attendance management system for Creative Garments Pvt. Ltd. (5 Marks)
  - ii. Identify the types of end-users of the proposed attendance management system for Creative Garments Pvt. Ltd. (2 Marks)
  - iii. Explain THREE possible benefits gained by the proposed attendance management system for Creative Garments Pvt. Ltd. (3 Marks)
- b) While analyzing the requirements to develop the attendance management system in part a) for Creative Garments Pvt. Ltd. assume that you were able to gather information about the existing attendance management process of the company. Model the attendance management process of Creative Garments Pvt. Ltd explained below using standard business process mapping tools. (10 Marks)

The attendance management process starts by receiving employee information from the machine operator. The employee information consists of name, NIC, address, contact number. The Factory Human Resource Manager records the details of the employee on the employee information database. Depending on the completeness of the information received, there will be a minimum delay of 15 seconds per each new finger print record. If the employee record is successfully completed, the Manager assigns an employeeID and daily wage to the machine operator and the system will display the “successful recruitment” message. If the information is not recorded successfully the system will automatically display a message of “unsuccessful finger print scan” and prompt the scanning display again. Once the information is successfully recorded the machine operator is assigned to a production line. The machine operator is required to scan the finger print before the start of the shift and after the end of the shift which will be recorded against the employeeID on the attendance information database. Base on the number of days attended per month the

monthly salary is calculated. If the machine operator attends all 22 days of the month, there is a 5% bonus given from the monthly salary. The salary details are printed once the calculation is completed and it is recorded in the salary information database. Upon salary recording of the month the attendance recording process will be closed.

- c) "Kolibree Toothbrush connects to your smartphone and encourages good brushing habits for both kids and adults by turning brushing into a game and saving data on your phone about your brushing habits."
- i. Identify and explain a type of modern Information System narrated above. (2 Marks)
  - ii. Briefly explain the capabilities of such Information Systems. (3 Marks)

## Question 2

[Total: 25 Marks]

### Part A

(15 Marks)

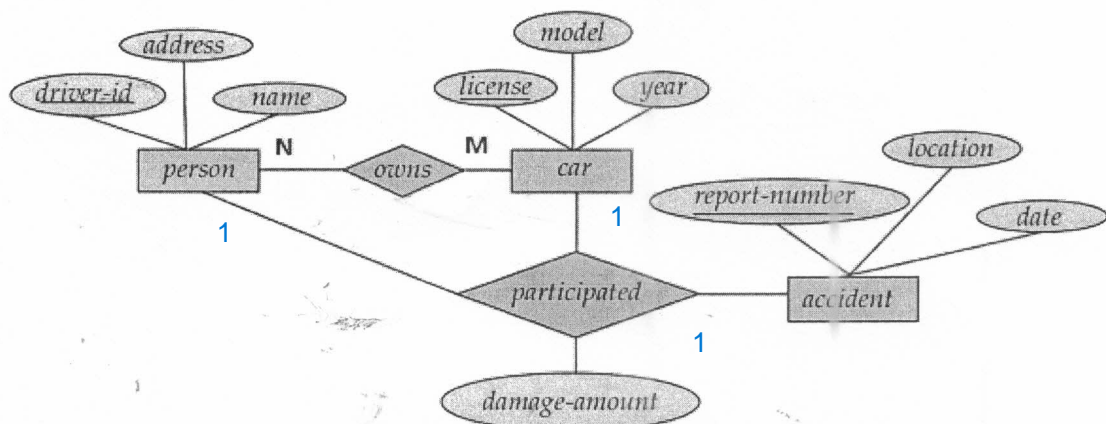
Construct an E-R diagram for a hospital database to store the in-house patient treatment information after considering the following requirement. Mark the Primary Keys, other attributes and relationships in the ER diagram.

There is a set of patients who are admitted in the hospital. It is necessary to keep the patient's NIC number, name, insurance details, gender, dob, date checked-in and date checked-out. Also for the set of medical doctors working in the hospital; doctor registration number, name and specialization have to be stored. Hospital needs a log of the various tests and examinations conducted on patients. It is necessary to keep track of the name of the test conducted, date and time it was conducted, the result of the test and the doctor who was responsible for the test.

### Part B

(10 Marks)

Following is a part of an Entity Relationship (ER) diagram designed for a Car Insurance Company. Convert the ER diagram to Relational Schema.



### Question 3

[Total: 25 Marks]

#### Part A

(15 Marks)

- 1) If a database design is not perfect, it may contain anomalies. Managing a database with anomalies is like a bad dream for any database administrator. Name the 3 types of anomalies that can be present in a database design. (5 Marks)
- 2) Consider the following details about the Student relation. Identify in which Normal Form the relation is in? Justify your answer. (10 Marks)

Student ( SID, student\_name, date\_of\_birth, gender, address, course\_code, course\_name)

Primary Key: SID

Functional Dependencies:

SID → student\_name, date\_of\_birth, gender, address, course\_code, course\_name

course\_code → course\_name

Consider all attributes in Student relation as atomic attributes

#### Part B

(10 Marks)

Consider the following schema and write the given queries in **Relational Algebra**.

STUDENT (SID, name, dob, address, CID)

COURSE (CID, course\_name, duration)

OFFERING (CID, MID)

MODULE (MID, module\_name, no\_of\_credits)

- 1) Find the number of credits allocated for the module 'Information Systems and Data Modelling'. (5 Marks)
- 2) Find the names of the students who follow the 'Information Technology' course. (5 Marks)

#### Question 4

[Total: 25 Marks]

Consider the following database schema and write the following queries in **Structured Query Language (SQL)**. The key fields are underlined, and the domain of each field is listed after the field name. The Catalog relation lists the prices charged for parts by Suppliers.

Suppliers (sid: integer, sname: string, address: string)

Catalog (sid: integer, pid: integer, cost: real)

Parts (pid: integer, pname: string, color: string)

- 1) Find the different types of parts supplied by the suppliers. List the supplier name and the part name. (3 Marks)
- 2) Find the total cost of the parts supplied by the supplier 'Yosemite Sham'. (4 Marks)
- 3) Find the names of parts that are supplied by more than 3 different suppliers. (6 Marks)
- 4) List the supplier id (sid) of the suppliers who supply 'red' color parts and also 'green' color parts. (6 Marks)
- 5) Find the name of the supplier who has supplied the highest number of parts. (6 Marks)