Sri Lanka Institute of Information Technology

B. Sc. Special Honours Degree/ Diploma
in
Information Technology

Final Examination
Year 1, Semester 2 (2016)

IT103 - Database Management Systems I

Duration: 2 Hours

Instructions to Candidates

- This paper contains 5 questions on 7 pages.
- This paper is preceded by a 10-minute reading period. The supervisor will indicate when answering may commence.
- Answer **ALL** questions.
- Read all questions before start answering.
- The total marks obtainable for this examination is 100.
- This examination accounts for 60% of the module assessment.
- This is a close book examination.

Question 1 **(30 marks)**

a) Draw the **ER diagram** to model the following real world situation. Your diagram should show entities, relationships along with the cardinalities and suitable attributes including the primary keys. (20 marks)

The organization committee of the *National Football League* (NFL) is in need to develop a system which stores the details about following requirements. The NFL has many teams registered for this year. Each team has to fill an application form that requires details such as name of the team, city from which they are coming from, name of the coach, name of the captain and the names of all players. When submitting the application form, the team is given a team id which helps to identify a team uniquely.

Each player of the team will have to individually register for the league. A player belongs to one team at any time and the team is formed by many players. A player is identified through player id. Player's name, NIC number, date of birth, age, position at game and a set of injury records as injuries are to be submitted to the officer at the registration desk. Also note that the team captain is also a player.

Teams play matches, there is a series of matches that takes place between different teams. Each match is uniquely identified by a match id. The committee needs to record details of each match in this league. Therefore, you should store the details of the teams that are playing a particular match, the date and the stadium in which the match is held, score and the referees. The committee has appointed 4 referees to referee a match. There is a pool of 20 referees. The details such as referee id, name, date of birth, and years of experience are recorded.

The committee has arranged few medical teams which looks into the medical emergencies during a particular match. There will be at least two medical teams at service during a match. Each medical team is given an id and has many medical staff (1 doctor, 2 nurses and 2 paramedics) involved. You need to record the name of the hospital and the city which the medical team is coming from.

There are leading companies that are providing sponsorships to host the league. Each team is sponsored by a company and in this scenario this company is referred as sponsor, who is

identified through a unique sponsor id. The sponsors register separately by providing details such as: name of the company, owner, address, contact-person and contact number. A company can sponsor only one team, while a team receives sponsorships from one or more companies. However, the committee is not interested in keeping track of the sponsor's details if the sponsored team is out from the League.

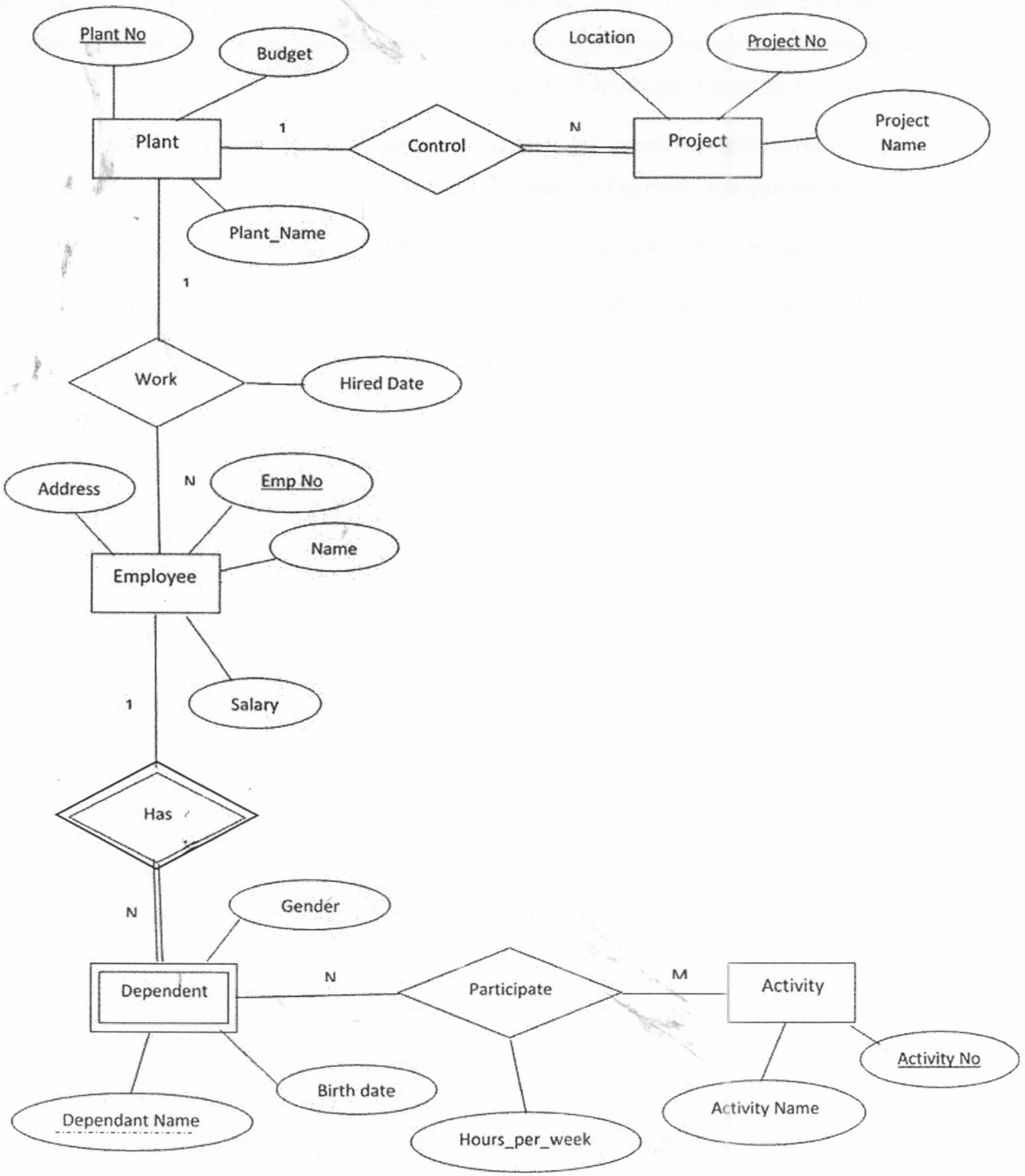
b) Consider the ER diagram drawn for question a) and map the **Player** entity to relational schema (consider primary key, foreign key, attribute types). (6 marks)

c) Show an instance of the tables mapped in question b). (3 marks)

d) What is the degree of the **player** table? (1 mark)

Question 2 **(15 marks)**

Map the ER diagram given below to a relation schema



Question 3 **(20 marks)**

ABIS is a higher education institute, which offers many courses. Each course offers a variety of modules. Each module will have a lecturer who teaches the module. The data about the institute is stored in tables given below.

Course (CID,c name, description)

Offering (CID, MID, year, semester)

Module (MID, mname, noOfCredits, EID)

Lecturer (EID,lname, designation, email, contact)

Write the following queries in **Relational Algebra.**

a) Display the names of the modules which contain 3 credits. (2 marks)

b) Display the names of the modules offered by each course. (3 marks)

c) What are the names of modules offered by the 'Information Technology' course for students in year one? (4 marks)

d) What are the names of modules not offered by the 'Business Management' course? (5 marks)

e) List down the names of lecturers who teach more than 5 modules. (6 marks)

Question 4 **(15 marks)**

The table below shows the Railway reservation details of "Sri Lankan Railway system".

Railway Info Table

Passenger ID	Train Number	Passenger Name	Departure Date Time	Destination	RouteID	Pick up point	Ticket Number	Ticket Price
LHR01	LTH1A	A. Perera	Mon 8.30	Colombo	SH021	ST1	LRM01	105.00
LHR02	LTH2A	H. Silva	Fri 16.30	Kandy	LHR01	ST1B	LRF0X	158.00
LHR03	LTH3B	S. Kumara	Sun 13.20	Polgahawela	NHG06	ST5	LRS05	112.00

Answer the following questions using the table and dependencies given below on the Railway Info table.

Railway_Info Table Primary Key :- (PassengerID, Train_Number)

Passenger ID -> Passenger Name

Train Number -> Departure Date Time, Destination

RouteID -> Pick up point

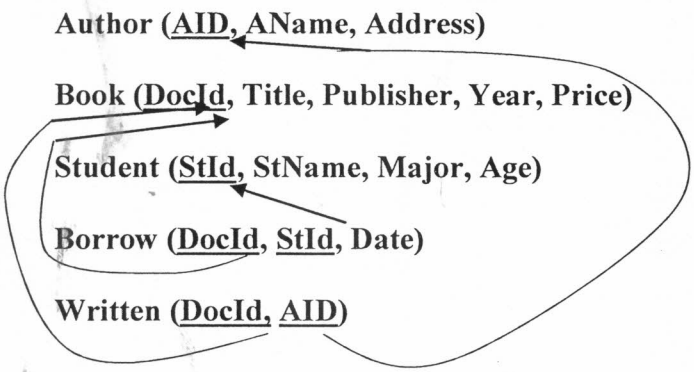
Ticket Number -> Ticket Price

a) Which normal form is the relation in? Explain your answer. (2 marks)

b) Decompose the relation into 3NF. For each step of the decomposition procedure, state what functional dependency it is based on, and give the relation schemas are the step has been carried out. (13 marks)

Question 5 **(20 marks)**

Consider the following relational schema of a library database. (Primary keys are underlined)



Write **SQL statements** to answer the following questions.

a) List the titles and author names of the books published by the publisher 'McGraw-Hill' before 2012. (4 marks)

b) Write a DML statement to enter the following student into the student table. (3 marks)

Student ID: IT16001
Name: Jayani Somarathne
Major: Computing
Age: not given

c) The library office wishes to store phone numbers of all students. Write required statements to add the phone number column to the existing student table. (4 marks)

d) Display the title of the most expensive book. (4 marks)

e) Display the names of the students who borrowed more than 2 books from the library. (5 marks)

***** End of Exam Paper *****