Sri Lanka Institute of Information Technology

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

Final Examination
Year 1, Semester 2 (2017)

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 is a close book examination.

Question 1 (27 marks)

'Health is Wealth' is a leading chain of pharmacies which supplies quality medicines for your prescriptions. The following requirements are given to model a pharmaceutical application for them.

Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name and has a phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a record on a pharmaceutical company is deleted, you need not keep track of its products any longer. Each pharmacy has a name, address, and phone number. Every patient has a primary doctor. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe for several patients, and a patient could obtain prescriptions from several doctors. A patient consumes one or more drugs and same drug will be consumed by many patients. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract. Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

a) Draw the **ER diagram** to model the above situation. Your diagram should show entities, relationships along with the cardinalities and suitable attributes including the primary keys.

(20 marks)

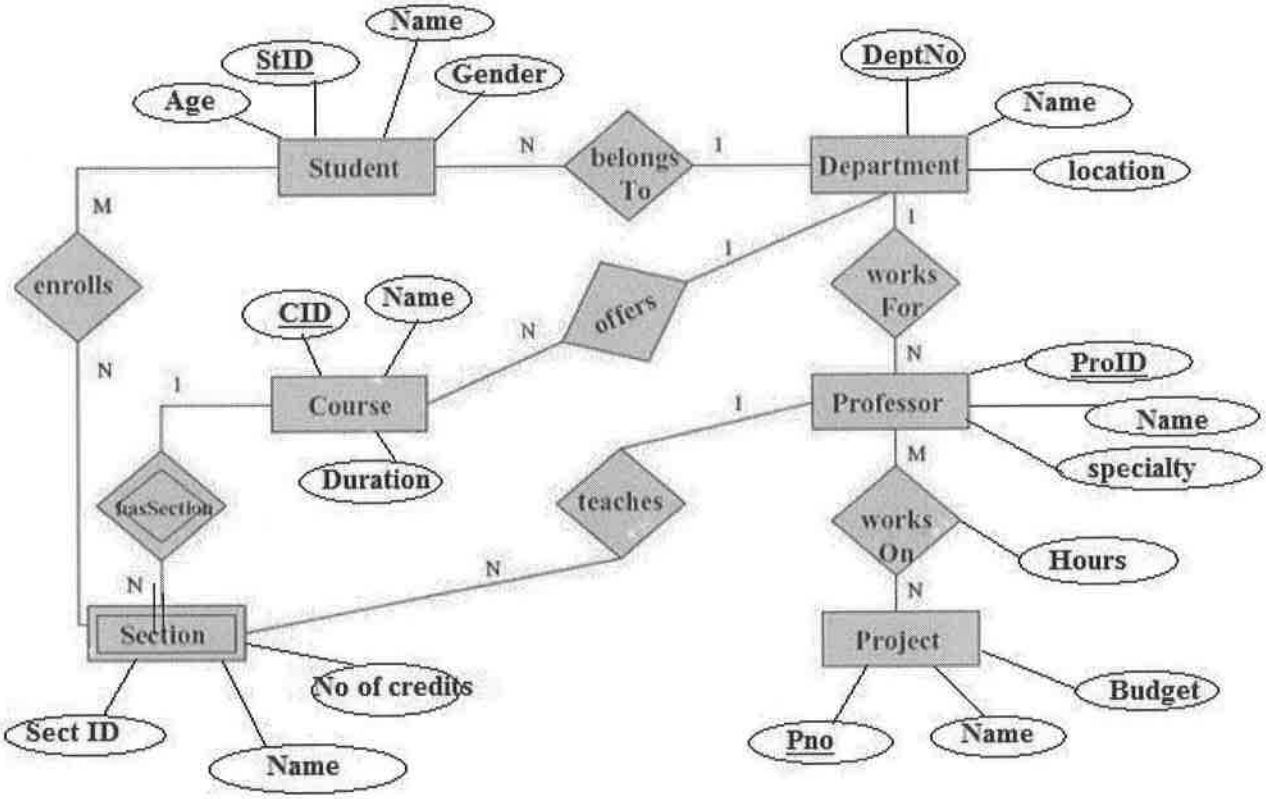
b) Consider the ER diagram drawn for question a) and map the **Drug** entity to relational schema (consider primary key, foreign key, attribute types). (3 marks)

c) Show an instance of the table mapped in question b). (2 marks)

d) What is the degree of the **Drug** table? (2 marks)

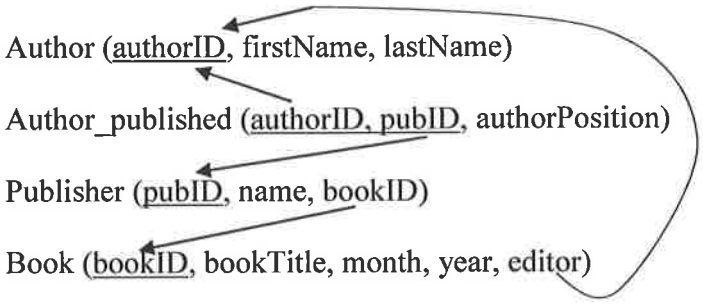
Question 2 (18 marks)

Map the ER diagram given below to a relation schema



Question 3 (20 marks)

'Wise Printers' is a printing company, which prints books according to the requests of publishers and authors. An author can publish his book with many publishers and author can serve as an editor for another author's book. The data about the printing company is stored in tables given below.



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

a) Display the titles of the books printed in 2017. (2 marks)

b) Display the first names of the authors who printed books in September 2016. (3 marks)

c) Find the authorIDs of the authors who are not serving as editors. (4 marks)

d) Display the lastname of the author who wrote both 'Fundamentals of Database systems' and 'Database Applications' books. (5 marks)

e) List down the first names of authors who edited more than 5 books. (6 marks)

Question 4 (15 marks)

The table below shows the project information of **'Markee Marketing Ltd'**.

Emp_Proj

Emp_ID	Project_No	Project_Name	Start_Date	Emp_Position	Name	Hours	Rate USD
E001	P1	Millers	12/10/2014	Coordinator	K.T.Roy	15	450
E002	P2	Cobler	01/05/2014	Advertiser	A.Smith	20	400
E001	P2	Cobler	01/05/2014	Advertiser	K.T.Roy	20	400
E003	P3	Wedlores	03/08/2014	Team lead	T.Bob	12	550

Emp_Proj table Primary Key :- (Emp_ID, Project_No)

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

Emp_ID → Name

Project_No → Project_Name, Start_Date

Emp_Position → Rate

a) Which normal form is the relation in? Explain your answer. (3 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. (12 marks)

Question 5 (20 marks)

'Eat pizza' is a pizza delivery service which keeps track of pizza restaurants and the customers. Consider the following relational schema of the pizza restaurants.

Customer (CID, name, age, gender)

Frequents (CID, restaurantID)

Restaurant (restaurantID, name, location , rating)

Serves (restaurantID, pizzaName , price)

Pizza (pizzaName, topping, crust, type)

Customer

CID	name	age	gender
C01	John	18	M
C02	Cathrine	25	F
C03	William	35	M

Restaurant

restaurantID	name	location	rating
Res01	Hippo	Bentley	A
Res02	Tamtan	Belmount	B
...	...	...	....

Prefers

CID	restaurantID
C01	Res01
C02	Res02
C03	Res01
....	....

Serves

restaurantID	PizzaName	price
Res01	Deviled chicken	2150
Res02	BBQ chicken	1200
Res01	Vege supreme	850
Res02	Deviled chicken	900
...	....	....

Pizza

PizzaName	Topping	crust	Type
Deviled chicken	Cheese	Thin	classic
BBQ chicken	mushroom	Italiano	Supremo
Vege supreme	Cheese	Dipper	Signature
...	...	...	....

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

a) Find the names of '**A**' rate restaurants which serve either mushroom or cheese topping pizzas. (4 marks)

b) Update the rating of 'Tamtan' restaurant from 'B' to 'A'. (3 marks)

c) The manager of the delivery service wishes to store phone numbers of all customers. Write required statements to add the phone number column to the existing customer table. (4 marks)

d) Display the name of the restaurant which serves the cheapest pizza. (4 marks)

e) Display the names of the customer who prefers more than one restaurant. (5 marks)

*** End of Exam Paper ***