Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 2, Semester 1 (2018)

IT2040 - Database Management Systems

| Duration: 2 Hours |
|---|

October 2018

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 4 pages, including the cover page.
- ◆ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Convert the following EER model in to the relational model. Indicate the primary keys and the foreign keys of the resulted relations clearly.
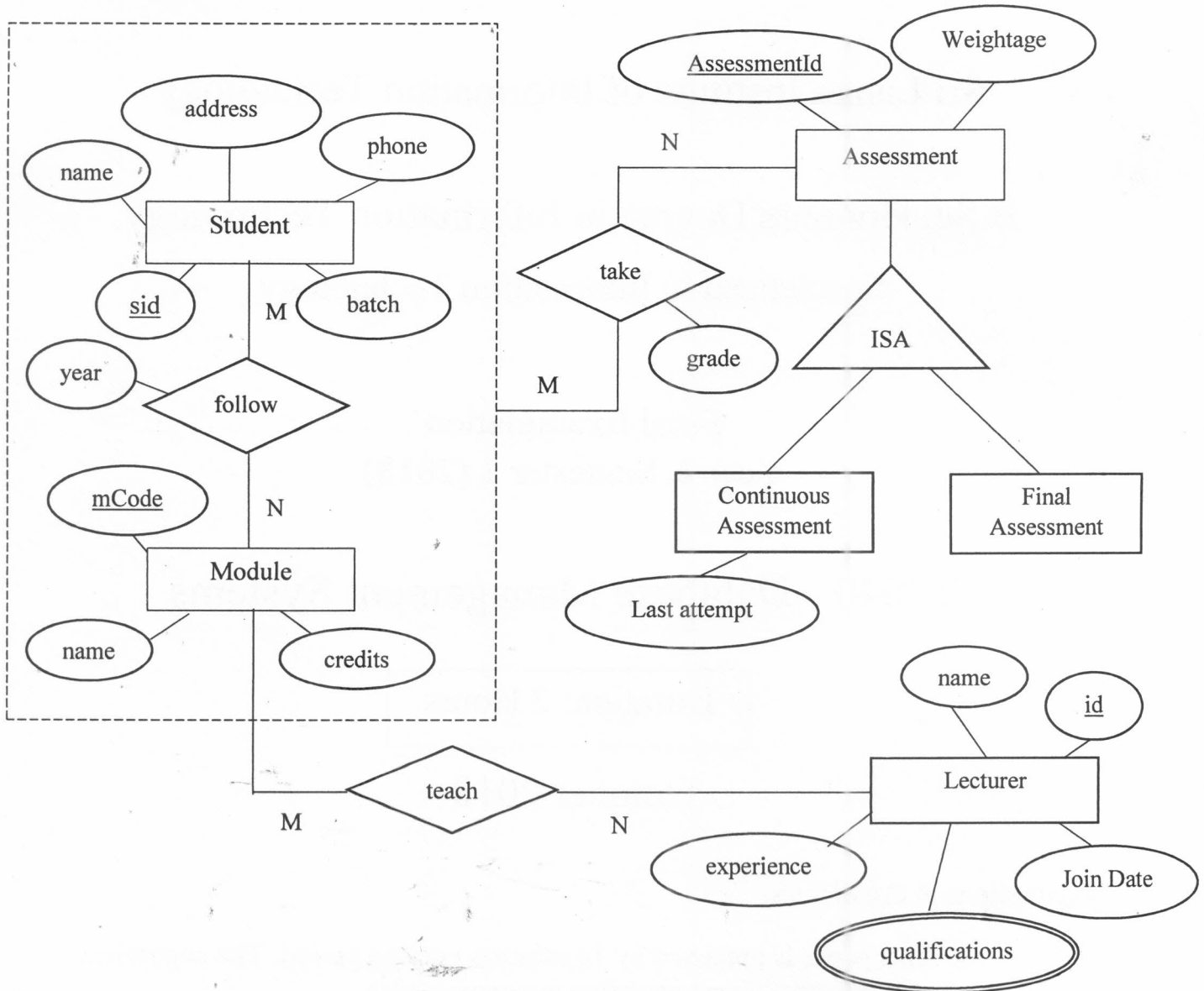
Continuous Assessment and Final Assessment Covers Assessment

Question 2 (15 marks)

Consider a relation R (A, B, C, D, E, F) with the following set of functional dependencies:

$$F = \{AB \rightarrow C, A \rightarrow D, B \rightarrow EF, F \rightarrow B \ \}$$

a) Find all the keys that follow from the given FDs using Amstrong Axioms, showing how you found them. (6 marks)

b) Is R in 3NF? Give reasons for your conclusion. (3 marks)

c) Is R in BCNF? If R is not in BCNF, convert it to a set of BCNF relations. (6 marks)

Question 3 (25 marks)

Consider the database of a library which rents books and CDs with the following schema:

Books (accessNo: *int*, title: *varchar(40),* author: *varchar(20)*, publisher: *varchar(30)*)

CDs (accessNo: *int*, title: *varchar(40)*, publisher: *varchar(30)*)

Member (memNo: *int*, name: *varchar(40)*, phone: *char(10)*)

Rental (accessNo: *int*, memNo: *int*, dateRented: *date*, dueDate: *date*, dateReturned: *date*)

Books table stores access number(*accessNo*), *title*, *author* and the *publisher* of the each Book. **CDs** table stores the access number (*accessNo*) , *title* and the *publisher* of each CD. **Member** table stores member number (*memNo*), *name* and phone number (*phone*) of each member of the library. **Rental** table stores the rental details including access number of book/CD (*accessNo*), member number of the member who had borrowed the book/CD (*memNo*), the date he/she has rented the book/CD (*dateRented*), the date on which the book/CD should be returned (*dueDate*) and the date on which the book is actually returned (*dateReturned*).

Write **relational algebra** statements to answer the following queries

a) Find the title and author of all books published by 'McGraw-Hill'. (2 marks)

b) Find title of books and the name of the member who had borrowed the book for books returned late than they are to be returned. (4 marks)

c) Find the names of members who had rented both books and CDs. (5 marks)

d) Find the names and the phone numbers of members who have more than 5 CDs which are returned late. (6 marks)

e) Find the title and publisher of the CD which is rented the most. (8 marks)

Question 4   **(40 Marks)**

Consider the following relations in a database created for an online store:

> Products (pid: int, productName: varchar (15), UnitPrice: real, unitsInStock: int, type: varchar (30))
>
> Suppliers (sid:int, supplierName:varchar(15), phone:char(10),address:varchar(50))
>
> Supplies (sid:int, pid:int, suppliedDate:date,amount:int,purchasePrice:real)
>
> SupplierPayments (sid:int, dateToPay:date ,amount:real)

The **Products** table contains id (*pid*), name (*productName*) unit price (*UnitPrice*), units in stock (*unitsInStock*) and *type* of product such as 'dairy' and 'poultry' for each product in the store. **Suppliers** table stores a unique id (*sid*), name (*supplierName*), *phone* and *address* of each supplier supplying products to the store. **Supplies** table stores information on supplies made by suppliers. For each supply, the table stores id of the supplier (*sid*), id of the product supplied (*pid*), supplied date (*suppliedDate*), amount of product supplied and the price at which the supplied item is purchased by the store (*purchasePrice*). **SupplierPayment** table stores information on payments made to suppliers. For supplies made by the suppliers per day, the SupplierPayment table stores the id of the supplier (*sid*), date on which the supply is made (*suppliedDate*) and *amount* of payment to be made for supplies made within that date. Primary keys of the tables are underlined.

a) Use SQL queries to answer following questions.
   i. Find the names and phone numbers of the suppliers living in Malabe who supplies at least one product which are sold at the store with a price more than Rs. 100.   (4 marks)

   ii. Assuming that the Unit Price of products are fixed, find the names of products which are always sold with a profit margin. Note that the items sold with a profit margin have a unit price for a product greater than the price it is purchased at.   (5 marks)

   iii. Find the names and phone numbers of customers who supply dairy products but do not supply Poultry products.   (7 marks)

b) Create a function named CalcPayment which calculates and returns the total payment to be made to a supplier for supplies made in a particular date, given the id of the supplier and the date the supplies are made.   (9 marks)

c) Create a trigger named updateSupplyInfo to do the following when a supply is made
   i. Update the units in stock for the relevant product in the product table
   ii. If there is no row already in the supplierPayment table related to the supplier id and the date the supply is made, insert a row with supplier id, supplied date and amount to be paid to the SupplierPayment Table. If a row is already exist with the relevant supplier id and the day the payment should be paid, update only the amount of payment to be made. (Hint : Use the function you have created in b) in order to calculate the payment)   (15 marks)