Sri Lanka Institute of Information Technology

B.Sc. Honours Degree/Diploma
in
Information Technology

Final Examination
Year 2, Semester 1 (2018)
Regular Intake

IT2040 - Database Management Systems

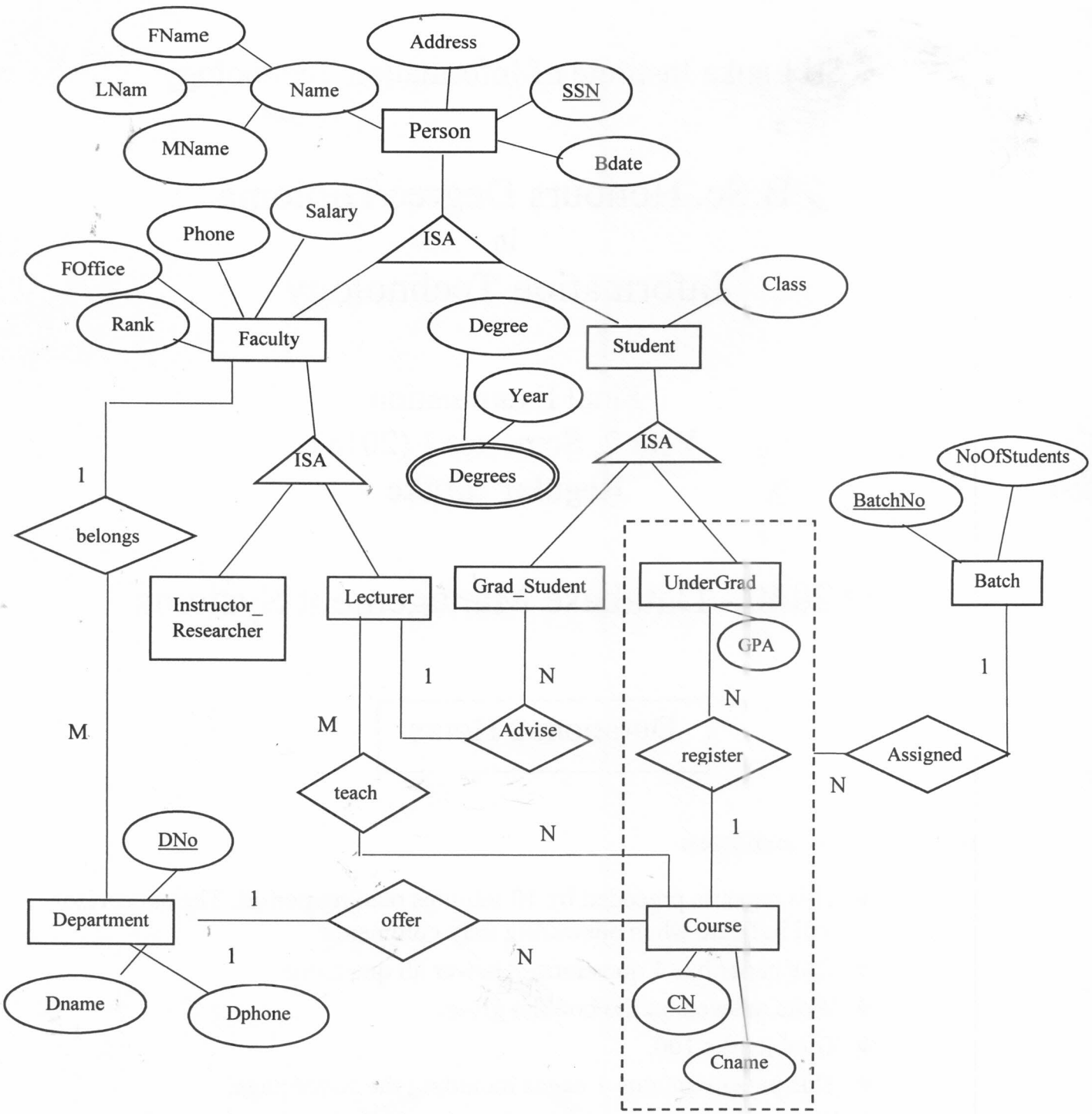
Duration: 2 Hours

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.
- Write answers in the booklet given.
- Total marks 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.

Question 1 (20 marks)

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



Question 2 (15 marks)

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

$$F = \{ A \rightarrow BC, BC \rightarrow E, E \rightarrow DA \ \}$$

a) Find all the keys that follow from the given FDs using Amstrong Axioms, showing how you found them. (9 marks)

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

c) Is R in BCNF? Give reasons for your conclusion. If R is not in BCNF, convert it to a set of BCNF relations. (3 marks)

Question 3 (25 marks)

Consider the database of a department store that includes the following tables:

ITEM (ino, iname, dept, price, availableQty, cost)

EMP (eno, ename, salary, comm, dept)

DEPT (dno, dname, mgrEno)

SALES (ino, eno, soldTime, soldQty, soldPrice)

ITEM table stores details of all items in the store. EMP table stores details of all employees working in the store. DEPT table stores details of all departments. SALES table stores details of all items sold.

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

a) Display the name and salary of all managers. (2 marks)

b) Display the names, prices and quantities available of items that are not sold. (4 marks)

c) Display the names of employees who had sold both computers and cameras. (5 marks)

d) Display the names of items which has more than 1000 pieces sold. (6 marks)

e) Display the name of the items which are sold the most. (8 marks)

Question 4 (40 Marks)

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

Customers (cid: char (4), name: varchar (50), phone: char(10), country: varchar(20))

Employees (eid: char (4), ename: varchar (50), phone: char (4), hiredate: date)

Orders (oid: int, eid: char (4), cid: char (4), orderDate: date, requiredDate: date, shippedDate: date)

OrderDetails (oid: int, productId: char (4), quantity: int, discount: real)

Products (productId: int,productName: varchar(15),UnitPrice: real unitsInStock: int,ROL:int)

The database stored information of their customers in the **Customers** table. The table contains customer id (*cid*), *name*, phone number (*phone*) and *country* of each customer of the store. **Employee** table contains employee id (*eid*), name (*ename*), phone number (*phone*) and the date hired (*hiredate*) of each employee. **Orders** table stores an unique id (*oid*), id of the employee responsible for the order (*eid*), date the order is placed (*orderDate*), the date the order is required by the customer (*requiredDate*) and the date the order is shipped (*shippedDate*) for each order. **OrderDetails** table stores order id (*oid*), product id (*productId*), quantity of the product ordered (*quantity*) and any discount obtained for the order (*discount*). **Products** table stores the id of product (*productId*), name of the product (*productName*), unit price of the product (*UnitPrice*) , number of units available in stock (*unitsInStock*) and the reorder level(*ROL*) of each product.

a) Use SQL queries to answer following questions.
   i. Display the name and address of customers who had ordered products which cost over Rs. 500. (4 marks)
   ii. Find the names and unit prices of all products which has not been ordered by customers from 'Germany'. (5 marks)
   iii. Find the customer ids and names of the customers who have obtained more than 5% discount for every product in every order they have placed. (6 marks)

b) Create a view named *incompleteOrders* that contains customer name, country and number of times an order is not completed for the orders that cannot be completed. Note that an order cannot be fulfilled when the units in stock is lesser than the quantity ordered for any product in the order. (7 marks)

c) Create a function named *calcCost* to calculate and return the total cost of an order given the order id and the discount. Note that the cost of the order is the total of costs for each product ordered where cost for each product ordered is obtained by the multiplication between unit price of the product and quantity. (8 marks)

d) Assume that a column named cost is added to the Orders table where the total cost of the order is stored. Create a trigger named *updateCost* to update the cost column when the order details are added to the **OrderDetails** table using the function created in part c) (*Hint: there could be more than one rows in order details table relevant to each order*). (10 marks)