



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
First Year – Semester II Examination – April / May 2015

ICT 1407 - Database Systems

Answer **All** Questions

Time allowed: Three hours

1.

- a. Figure 1 shows a partially completed ER diagram that represents a design of a conceptual schema of a database system for a library. This library provides borrowing, returning, reserving functionalities. Answer the following questions with regard to the figure 1. Justify all your answers and clearly state any assumption made.

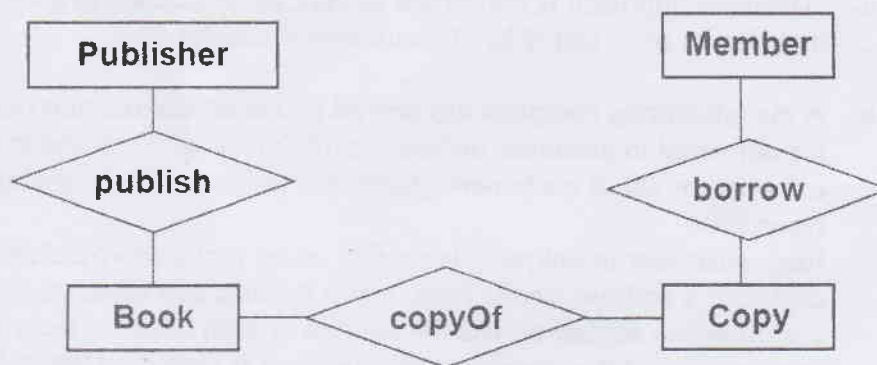


Figure 1.

- i. Identify the essential attributes for entity types and relationship types that are shown in the diagram. Justify your answer. (4 Marks)
- ii. Identify the cardinality ratios of the relationship shown in the diagram. Justify your answer. (4 Marks)
- iii. Provide relational mapping for ER diagram which is modified in section i and ii. (4 Marks)

- b. What is data independence? Distinguish between logical and physical data independence. Illustrate your answer with an example. (4 Marks)
- c. Describe all the major steps involved in designing and implementing a database system. (4 Marks)
- 2.
- a. Taking Suitable examples explain the following terms
- Candidate Key
 - Primary Key
 - Foreign key
 - Cardinality of a relationship
 - Degree of a relationship (2*5 Marks)
- b. What is the difference between the two-tier and three-tier client/server architectures? (2 Marks)
- c. If you were designing a Web-based system to make airline reservations and sell airline tickets, which DBMS architecture would you choose? Give reasons. Why would the other architectures not be a good choice? (5 Marks)
- d. Discuss the entity integrity and referential integrity constraints. (3 Marks)
- 3.
- a. "Database approach is concerned as very advantageous in many concerns. But it also includes its costs and risks" Discuss this statement. (5 Marks)
- b. A manufacturing company has several plants to manufacture items. The items ordered are delivered to customer outlets in different cities. A database is to be used to record information about customers, items and orders. The following information is to be recorded.
- Each customer is uniquely identified using a customer number and his name. Each customer's address, credit limit, credit balance and discount are to be recorded. As a customer has several outlets the address of each outlet is recorded. An order is issued to an outlet and the corresponding customer is identified through its address.
- An item is uniquely identified by an item number, and has a description and a unit price. A plant is identified by the plant name. A plant manufactures many items and for each item manufactured by a plant the quantity on hand is maintained with respect to each plant. Hence when an item is issued to a customer the quantity on hand is updated for the item of corresponding plant. The stock danger level for each item at each plant identifies when to manufacture that item.
- When an order is placed a unique order number is issued. Order date and customer address is recorded along with the details of order. Order details consist of item number, quantity ordered and quantity supplied (sometimes the quantity supplied is less than quantity ordered). The order value is calculated using the unit price and

discount of the customer. Credit orders will take place only if the customer credit balance does not exceed his credit limit.

- i. Draw an Entity- Relationship diagram for the above system. (15 Marks)

4. Consider Following relations to answer the Questions in 'Part a'

Vendor (vno, vname, city)

Item (ino, description, type,city)

Customer (cno, cname, city)

Delivery (vno,ino,cno,quantity)

Vendor

vno	Vname	city
V1	E-W Information Systems	Kandy
V2	Softlogic	Colombo
V3	IBM Computers	Colombo

Item

ino	description	type	city
I1	IBM	P3	Colombo
I2	Dell	P4	Galle
I3	Toshiba	P3	Kandy
I4	ICM	P4	Kandy
I5	IBM	P4	Colombo
I6	Toshiba	P4	Kandy

Customer

cno	cname	city
C1	Bank of Ceylon	Kandy
C2	Peoples Bank	Colombo
C3	Bank of Ceylon	Galle
C4	Hatton National Bank	Colombo
C5	Peoples Bank	Kandy

Delivery

vno	ino	cno	quantity
V1	I1	C1	150
V1	I5	C1	100
V1	I5	C4	150
V2	I2	C1	50
V2	I2	C4	500
V2	I2	C5	500
V2	I3	C4	300
V2	I6	C4	300
V3	I1	C1	10

- Identify the primary keys, foreign keys for the above relations. (4 Marks)
- Provide conceptual design (Draw ER diagram) for above relations. (Hint: consider the modification done in 'part a') (4 Marks)
- Write Relational Algebra statements to get the following information
 - All information about all Customers. (1 Mark)
 - Vendor numbers for Vendors who deliver to Customer C1. (1 Mark)
 - All deliveries where the quantity is between 100 and 250 (2 Marks)
- Write Relational Algebra statements to get the following information
 - Item numbers for Items delivered by a Vendor in Colombo (2 Marks)
 - Item numbers for Items delivered by a Vendor in Colombo to a Customer in Colombo (2 Marks)
 - Item description of items which are delivered to the customers in Kandy. (2 Marks)
 - Names of vendors who delivered items to Peoples Bank at Kandy. (2 Marks)

- 5.
- What is the difference between primary and secondary storage. (3 Marks)
 - "Index files always offer better performance than unordered files". Discuss. (3 Marks)
 - Consider following un-normalized relation for students' grade report.

Student ID	Student Name	Home Town	Degree	Course Id	Course Name	Lecturer Id	Lecturer Name	Lecturer Address	Grade
2020	Sara	Matara	Bsc. in ICT	ICT 1305	OOP	L01	Mark	Colombo	A
				ICT 1402	Networking	L02	Sam	Moratuwa	B
2030	Andrew	Gall	Bsc. in ICT	ICT 1204	Mathematics	L03	Mike	Malabe	C
				ICT 1307	OS	L02	Sam	Moratuwa	A+
				ICT 1305	OOP	L01	Mark	Colombo	C

- Describe different types of anomalies that can be occurred in the above table. (6 Marks)
- As a database designer, you are supposed to normalize the grade report relation up to Third Normal form (3NF). Show how you transform in to 1NF, 2NF and 3NF. State any functional dependencies you have identified. (8 Marks)