



**UNIVERSITY OF KELANIYA – SRI LANKA
+FACULTY OF SCIENCE**

**Bachelor of Science (General) Degree (External)
First Year Second Semester Examination - 2019**

**Computer Studies
COST 17543 – Database Management Systems**

No of Questions: Five (05) No. of Pages: Five (05) Time: Two (02) Hours

Answer Four (04) Questions Only

1. (a) (i) Name and briefly explain two (02) types of databases with an example per each.
(ii) List four (04) major facilities provided by a database management system.
(iii) Briefly describe two (02) of the main characteristics of the database approach.
(iv) Briefly discuss two (02) situations where a database management system cannot be used.
 - (b) (i) Briefly discuss the difference between a database schema and database state using a suitable example.
(ii) Illustrate the three-schema architecture.
(iii) Briefly explain two (02) advantages of the of three-schema architecture.
 - (c) (i) Distinguish the distributed database systems from centralized database systems.
(ii) Briefly discuss two (02) types of distributed systems.
2. **Fair Shop** is a leading selling store, which has branches in the main cities of the country. This is known for quality products, affordable price range, timely services, fast cash-on-delivery facility. The store has island-wide customers and procures goods from various local and foreign vendors. The data requirements for the store are summarized as follows:

Fair shop maintains an inventory of various categories of items. The details of the various item categories, such as the item category numbers and the corresponding category names should be recorded. Further, they should maintain the item details such as item number, item description, item category number, serial number of the item, colour (red, blue, black), the unit price of each item, and reorder level of each item that is calculated using the unit price and purchased date. For the kids' items, specifically, the suitable age should be maintained, and for the food items, the expiry date should be separately maintained. Also, the store has

several regular suppliers for various items. The suppliers are spread over various geographical locations in the world. There, a supplier record should consist of the supplier code, supplier's name, address, phone number, country of origin, and shipment mode number for suppliers. Whenever the employee of a store places a purchase order, a purchase order form needs to be filled out. The following information from the purchase order form should be included relevant to a purchase.

Purchase Order Form	
Purchase Order ID:	Supplier ID:
Employee ID:	Serial Number of Item:
Supplier Category: Local/International	Order Date:
Quantity:	Delivery Date:

Details of the employees such as employee ID, national ID, name, and address also should be recorded. Moreover, the customers should be registered to a particular branch of this store by submitting a form with customer name and address, before doing a purchase. To uniquely identify a customer, the customer ID should be referred through the branch ID. In addition to that, the branch details including the branch ID, branch name, and manager ID are also must be maintained.

Considering the above description answer the following questions.

- (i) Identify the entities that could be used for the above requirements.
- (ii) Identify suitable attributes and the primary keys for each of the entities, and for each of the entities that you have identified, list the multi-valued, composite, and derived attributes if any.
- (iii) Is/Are there any weak entity/entities? If so, give the owner/owners.
- (iv) Identify a superclass/subclass relationship from this description. Justify your answer.
- (v) Draw a suitable EER (Enhanced Entity Relationship) diagram for the **Fair Shop** database. State any assumptions that you make.

3. Following table contains sample data of students, parking violations and the respective penalties at University of Kelaniya. It is evident that the students can be uniquely identified by student ID, violations can be uniquely identified by the violation code, and Tickets can be uniquely identified by the with the ticket number.

St_ID	Name	Ticket No.	Date	Violation Code	Violation Details	Penalty (LKR)
HS1224	B. Rajasekara	17624	09/05/2022	2	No Parking Permit	100
		18897	19/06/2022	1	Not a Parking Lot	50
SS0598	M. Narasinghe	17983	23/05/2022	3	Handicap Violation	150
		18112	31/05/2022	1	Not a Parking Lot	50
		18702	09/06/2022	2	No Parking Permit	100

- (i) Convert this table into Parking_Tickets_UOK relation, which is in First Normal Form.
- (ii) List the functional dependencies in Parking_Tickets_UOK relation and identify the candidate key.
- (iii) (A) Name three anomalies that can arise in the Parking_Tickets_UOK relation.
- (B) Give an example for each of the above anomalies from the Parking_Tickets_UOK relation.
- (C) Why do these anomalies occur?
- (iv) (A) Apply normalization until this dataset achieves the highest normal form.
- (B) What is the highest normal form the Parking_Tickets_UOK relation can be decomposed?
- (C) List the primary key(s) and foreign key(s) in each relation.

4. Considering the following database schema, answer the part (a) and (b) below:

Mechanic (mnum, mname, monthly_salary, qualification_level)

Repair (rcode, type)

Vehicle (licenseNo, ownerID, name, address)

Perform (mnum, licenseNo, rcode, location, date, charges)

The underlined attributes are the primary keys of respective relations.

(a) Suppose that the following is part of the data definition statement for the above Perform relation.

```
CREATE TABLE Perform
(mnum NUMBER DEFAULT 1,
 licenseNo VARCHAR(10) not null,
rcode NUMBER not null,
...
constraint pk1 primary key (mnum, licenseNo, rcode),
constraint fk1 foreign key (mnum) references Mechanic (mnum)
on update cascade on delete cascade,
...
);
```

(i) Give the constraints that are defined in the above data definition statement.

(ii) Explain what happens when a tuple in the relation Mechanic is deleted or updated.

(iii) State whether the given action is suitable for deletion. If not, give a suitable action. Justify your answer.

(iv) Write another referential integrity constraint that should be considered in the above data definition.

(b) Consider the following view defined on the relation Mechanic:

```
Create view Summary (qualification_level, Tot_exp_on_salary)
As select qualification_level, sum(monthly_salary)
From Mechanic
Group by qualification_level;
```

Is this view updatable? Justify your answer.

5. Consider the following relations that are constructed to store the information of a restaurant:

Cook (CoNo, NIC, Name, Address, Specialty)

Cashier (CashNo, NIC, Name, Address, No_accepted_Orders)

Food_Item (FoodItemNo, Name, Ingredients)

Customer (PhoneNo, Name, Address)

Order (CashNo, FoodItemNo, CoNo, Cust_Phone_No, No_of_Portions, Price, Date)

Express each of the following queries using relational algebra and tuple calculus.

- (i) Find the NICs and names of cashier/s who has/have accepted more than 10 orders.
- (ii) Find the order number, cashier's name, cook's name, and food item number of the orders placed between 01/01/2022 to 31/01/2022.
- (iii) Find the name/s and the specialty of the cooks who prepared both the food items "Ind. Spanish Club" and "Spicy Paneer Bowl" in any order, on any day.
- (iv) Find the name, phone number, and address of the customer who placed an order through the cashier "Nimal".

//