00230

Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year I, Semester II (2022)

IT1090 – Information Systems and Data Modelling

Duration: 02 Hours

November 2022

Instructions to Candidates:

- This paper has 05 questions.
- Answer all questions in the booklet given.
- This paper is marked out of 100 and contributes 60% of the Final Grade.
- This paper contains 07 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 01

[Total 25 Marks]

a) Globalz Study is an institute which offers programs diversified to computing, business and engineering. The institute owns a latest collection of books and periodicals, particularly in the field of Information Technology, business management, engineering, general English, architecture and quantity surveying. Library is open to students daily including weekends from 7.00am to 7.00pm. Institute maintains a manual process to record the major processes of the library. Among the major processes of the library are the registering of members, recording of new library material details, recording of book borrowing details and recording of book returning details.

Following is the process followed when handling the returning of the books by the members. Consider the activities involved and draw the Process Map.

- Members are required to return the borrowed material according to the returned date mentioned in the material. If the member is unable to return on the due date, the library will charge a fine for the additional number of days the materials are kept. (10 marks)

b) The inventory control system at Nutri Foodcity records the availability of items. At the end of each month the system generates reports on items available in the inventory and the sales made. Once a sale or a purchase is made the item availability is updated.

i) Identify the inputs captured by the input function of the inventory control system. (02 marks)

ii) Identify the outputs presented by the output function of the inventory control system. (02 marks)

iii) Identify the stored data of the inventory control system. (02 marks)

iv) Identify the subsystems (processes) of the inventory control system. (02 marks)

c) Bigz Store is a large store with branches in several locations. They guarantee that their advertised merchandise is always available to retain their customers. So, it is essential for them to have an accurate and a just-in-time approach to inventory control. Also, they want to improve the efficiency and reduce waste as much as possible.

i) Give 03 specific advantages Bigz Store can gain by having a database solution to handle their inventory data and transaction data? (03 marks)

ii) In the Three Schema Architecture which schema includes details about the inventory data stored in the database? (02 marks)

iii) In the Three Schema Architecture which schema describes details about the indexes created to speed up data retrieval? (02 marks)

Question 02 **[Total 20 Marks]**

The following description is about the requirements for an online supermarket of a company. Analyze the data requirements from the given scenario and construct the E-R diagram. For each entity identified include a suitable Primary Key and at least 1 other attribute whenever specific attributes are not mentioned in the below requirements.

A user can go through an item catalogue from the website to select the items they need to order, and the selected items can be added into a shopping cart as well. They can select any number of items, and from each item they can order multiple units. While user adds items to the shopping cart, the system automatically calculates the total bill for the user, and until user checkout the order, he/she can add or remove items from the shopping cart.

The supermarket system registers each user and for communication purposes it is important that they keep at least 2 contact numbers for each user. To maintain sensitive details like Usernames, Passwords and Security Questions related to login, system keeps a separate user profile. Also, the system facilitates reusing the same order and a user can do customization to the item quantity. The system keeps track of such actions and can update the order date accordingly. In such cases it is necessary for the supermarket to keep track of past order data as well as the new order data related to a user.

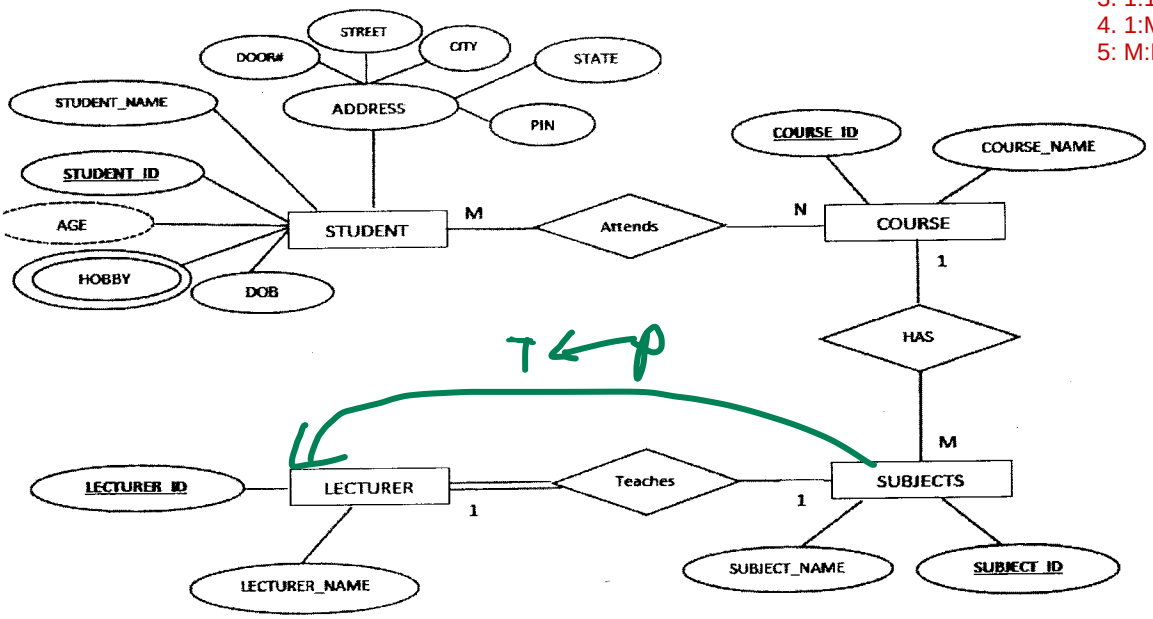
User can write reviews about the service or items they received. Each review received is forwarded to a manager selected by the system through an alert notification. The manager considers the review and should take necessary actions accordingly. Once a user decides to remove themselves being a registered user of the online store, the store is not interested in keeping details about the reviews provided by those.

Question 03 **[Total 15 Marks]**

Convert the following ER Diagram to the Relational Schema.

Note: Use the names given in the ER when converting to the schema whenever possible

Steps for select entity order
1. strong entity OR regular
2. weak entities
3. 1:1
4. 1:M
5: M:N



Lecturer(Lecture_ID, Lecturer_Name, Subject_ID)

Subjects(Subject_ID, Subject_Name, Course_ID)

Course(Course_ID, Course_Name)

CourseStudent(Course_ID, Student_ID)

Student(Student_ID, Student_Name, Age, DOB, DOOR, STREET CITY STATE PIN)

StudentHobby(Student_ID, Hobby)

Question 04 **[Total 15 Marks]**

Consider the following schema and the set of functional dependencies.

StudentPerformance (StudentNo, CourseNo, Mark, Grade, Degree, Lecturer, StudentName)

StudentNo ⟶ StudentName

CourseNo ⟶ Lecturer

Mark ⟶ Grade

a) In which Normal Form (NF) is the schema StudentPerformance in? Explain your answer. 1NF (03 marks)

There is not a primary key, It is a composite key. So there are no any repeating groups.

b) If the schema is not in 3NF convert it to a schema in 3NF. Explain each step of your answer. (12 marks)

UNF → Studentperformance (StudentNo, CourseNo, Mark, Grade, Degree, Lecturer, StudentName)

No repeating groups

1NF → Studentperformance (StudentNo, CourseNo, Mark, Grade, Degree, Lecturer, StudentName)

There is composite key

2NF → Studentperformance_A(StudentNo, StudentName)

Studentperformance (StudentNo, CourseNo, Mark, Grade, Degree)

Studentperformance_B (CourseNo, Lecturer)

There is transitive FD

3NF → Studentperformance_A(StudentNo, StudentName)

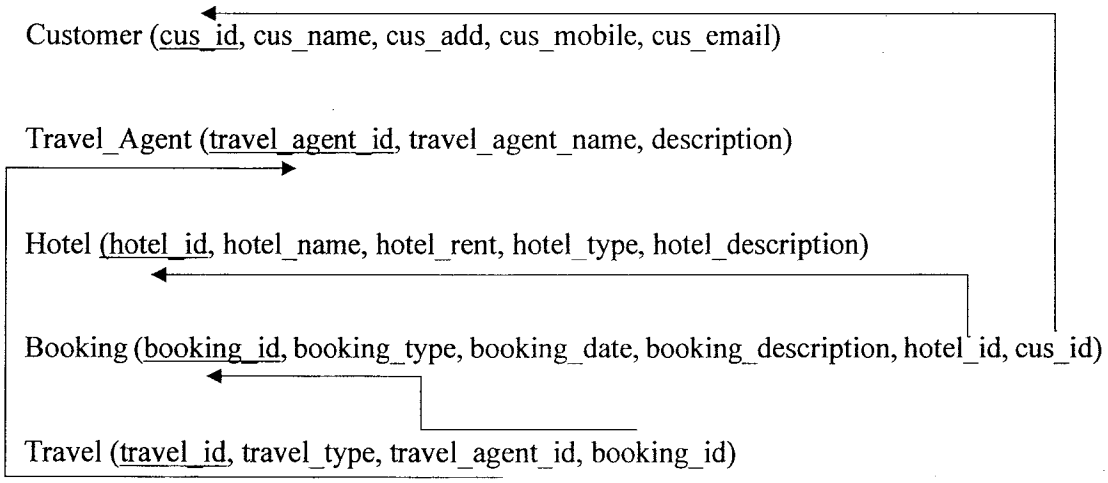
Studentperformance (StudentNo, CourseNo, Mark, Degree, Lecturer)

Studentperformance_B (CourseNo, Lecturer)

Studentperformance_C (Mark, Grade,)

Question 05 **[Total 25 Marks]**

Consider the following database schema for a **Tourism Management** system database and construct the given queries in SQL.



a) Find the hotel ids and names of those of hotel for which the rent is more than 10000 and includes the word 'hotel' in it's name. (04 marks)

b) Find the customer ids and the customer names who has booked a hotel. Then, sort the result according to the descending order of the customer's name. (05 marks)

c) Find the travel agent id who has taken highest number of travels than all other travel agents. Display the travel agent id, and name. (08 marks)

d) For each customer who has booked more than 2 hotels, display the id, name, address of the customer along with the number of hotels booked. (08 marks)

a.)
```
SELECT hotel_id, hotel_name
FROM Hotel
WHERE hotel_rent > 1000 AND hotel_name LIKE  "%hotel%";
```

b.)
```
SELECT c.cus_id, c.cus_name
FROM Booking b, Customer c
WHERE b.cusid = c.cus_id
ORDER BY c.cus_name desc;
```

c.)
```
SELECT travel_agent_id, travel_agent_name_description
FROM travel_agent
WHERE travel_agent_id = (
  SELECT travel_agent_id
  FROM travel
  GROUP BY travel_agent_id
  ORDER BY COUNT(*) DESC
  LIMIT 1
);
```

d)
```
SELECT c.cus_id, c.cus_name, c.cus_add, COUNT(*) AS num_hotels_booked
FROM customer c,  booking b
WHERE c.cus_id = b.cus_id
GROUP BY c.cus_id, c.cus_name, c.cus_add
HAVING COUNT(*) > 2;
```

----------End Of Paper----------