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SOUTH EASTERN UNIVERSITY OF SRI LANKA
FACULTY OF TECHNOLOGY
DEPARTMENT OF INFORMATION & COMMUNICATION
TECHNOLOGY
BACHELOR OF INFORMATION & COMMUNICATION TECHNOLOGY
FIRST EXAMINATION SEMESTER I - DECEMBER 2019
CIS-11022 DATABASE DESIGN

Answer **ALL** Questions

Time allowed: **TWO (02) Hours**

- 1 a) Define the following terms:
- a. Data
 - b. Information
 - c. Data independency
 - d. Database Management System (20 Marks)
- b) Explain followings with suitable examples:
- i. Data Model
 - ii. Data Definition Language (20 Marks)
- c) i. What are the benefits of a database management system over a manual system? Provide three (03) examples.
- ii. Provide two (02) situations where database should not be used. (30 Marks)
- d) Explain the three-tier architecture of DBMS along with followings: Levels, schema, and mappings. You are advised to explain with the illustration. (30 Marks)

[Total 100 Marks]

- 2 a) Define the following terms:
- a. Composite attribute
 - b. Weak entity
 - c. Entity
 - d. Cardinality (20 Marks)
- b) Galleries keep information about artists, their names (which are unique), birthplaces, age, and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lives, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!) and the artists and groups of art that the customer tends to like. Draw the ER diagram for the database. Design and draw an ER diagram based on above scenario that captures the information about the Galleries by identifying entities, relationships, cardinality ratio and attributes. Be sure to indicate any key and participation constraints and state any assumption you made (80 Marks)

[Total 100 Marks]

- 3 a) Define the following terms:
- Relation schema
 - Tuple
 - Domain constraint
 - Referential integrity
- (20 Marks)
- b) Explain the distinctions among the terms primary key, candidate key, and super key.
- (15 Marks)
- c) What is normalization? What is the major goal of normalization?
- (20 Marks)
- d) Answer the followings;
- The following relation $R = (A, B, C, D)$ is given below with the following function dependencies $\{A \rightarrow B, BC \rightarrow D, A \rightarrow C\}$
 - Find the all candidate keys.
 - Identify the best normal form that R satisfies (1NF, 2NF or 3NF)
 - The following relations $R = (A, B, C, D, E)$ is given below with following functional dependencies $\{CE \rightarrow D, D \rightarrow B, C \rightarrow A\}$.
 - Find all candidate keys.
 - Identify the best normal form that R satisfies (1NF, 2NF, 3NF or BCNF? Explain your answer in detail.
 - The following relations $R = (A, B, C, D, E)$ is given below with following functional dependencies $\{BCE \rightarrow ADE, D \rightarrow B\}$
 - Find all candidate keys.
 - Identify the best normal form that R satisfies (1NF, 2NF, 3NF or BCNF? Explain your answer in detail.
- (45 Marks)

[Total 100 Marks]

- 4 a) Consider the following tables and answer the questions given below using relational algebraic notations.

student		enrolledIn		subject	
id	name	id	code	code	lecturer
1234	joe	1234	cs1500	cs1500	curtis
4000	hector	1234	cs1200	cs2001	dave
2000	ling	1234	cs2001	cs3010	curtis
		4000	cs3010	cs2001	olivier
		4000	ma3000	ma3000	roger

- Print the name of the students.
 - Retrieve the subject codes where "Curtis" takes.
 - Retrieve the student id, name and code where student id = 1234.
 - Retrieve the code for the following output.
- | <u>id</u> | <u>name</u> | <u>id</u> | <u>code</u> |
|-----------|-------------|-----------|-------------|
| 1234 | joe | 1234 | cs1500 |
| 1234 | joe | 1234 | cs1200 |
| 1234 | joe | 1234 | cs2001 |
| 1234 | joe | 4000 | cs3010 |
| 1234 | joe | 4000 | ma3000 |
- What are the names of the students taking a subject taught by "Roger"?
- (50 Marks)

- b) Answer the following questions using SQL statements by referring the following relational schema. Note that the keys of the relations are underlined.

Employee (employee-name, street, city)

Works (employee-name, company-name, salary)

Company (company-name, city)

Manages (employee-name, manager-name)

- i. Find the names, street address, and cities of residence for all employees who work for 'First Bank Corporation' and earn more than \$10,000.
- ii. Find the names of all employees in the database who live in the same cities as the companies for which they work.
- iii. Find the names of all employees in the database who do not work for 'First Bank Corporation'. Assume that all people work for exactly one company.
- iv. Find the names of all employees in the database who earn more than every employee of 'Small Bank Corporation'. Assume that all people work for at most one company.
- v. Find the names of all employees who earn more than the average salary of all employees of their company. Assume that all people work for at most one company.

(50 Marks)

[Total 100 Marks]