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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
First Year - Semester I Examination – September/October 2019

COM 1302 – DATABASE MANAGEMENT SYSTEM

Time: Three (03) hours

Answer **ALL** the questions.

1.

a) List down the three methods of file organization and explain each of them. (5 marks)
b) Give (03) three characteristics of database approach. (3 marks)
c) Explain the main phases of database design. (4 marks)
d) Define following terms
   i. Data Model
   ii. Data Schema
   iii. Primary Key
   iv. Referential integrity (2 *4 marks)

2.

Consider the scenario below and answer the following questions.

There is a library system with the following properties. The library contains one or several copies of the same book. Every copy of a book has a copy number and is located at a specific location in a shelf. A copy is identified by the copy number and the ISBN number of the book. Every book has a unique ISBN, publication year, title, author, and the number of pages. Books are published by publishers. A publisher has a name as well as a location. Within the library system, books are assigned to one or several categories. A category can be a subcategory of exactly one other category. A category has a name and no further properties. Each reader needs to provide the family name, first name, city,

and date of birth to register at the library. Each reader gets a unique reader number. Readers borrow copies of books. Upon borrowing the return date is stored.

a) Create an ER diagram for this library system. (15 marks)
b) Convert the ER diagram you drew in (a) above into relational database schema with primary keys and referential integrity constraints. (5marks)

3.

a) Explain the use of "GROUP BY" clause in SQL by using example. (2 marks)
b) **"SQL Statements are basically divided into two categories"**
Mention those two categories and briefly explain them with examples. (6 marks)
c) By studying the following relational schemas and write the MYSQL queries for the given scenarios.
Employee (EmpID, EmpName, Address, JoinDate, NIC, BasicSalary, ProjectCode)
Project (ProjectCode, ProjectName, Duration, Coordinator)

i. Create Employee table. Use proper data types when required and clearly indicate the primary and foreign keys. (3 marks)
ii. Get details of employees whose names are having only 4 characters. (3 marks)
iii. Update the duration as 8 in the project table where the project code is "P15101". (3 marks)
iv. Show the details of employees who are working on projects of which the coordinator is Sarah. (3 marks)

4.

a) What are main two categories of outer join in relational algebra? Briefly explain each. (3 marks)
b) Express the relational algebra operation "**Insertion**" only using the basic operations. (2 marks)
c) Assume the following relational schemas-:
BOOKS (DocId, Title, Publisher, Year)
STUDENTS (StId, StName, Major, Age)
AUTHORS (AName, Address)
Borrows (DocId, StId, Date)
Has-written (DocId, AName)
Describes (DocId, Keyword)
Answer the following questions by writing the correct algebraic queries:
i. List the year and title of each book. (2 marks)
ii. List all books published by McGraw-Hill before 1990 (3 marks)
iii. List the name of students who are older than 30 and who are not studying CS. (3 marks)
iv. List the title of books written by the author 'Ullman'. (3 marks)

d) Write the SQL query for following relational algebraic expression.

$\pi_{A, C}(r) \bowtie \pi_{C, D}(s)$ (4 marks)

5.

a) Define "normalization". (2 marks)

b) What is the importance of using dependencies and keys in normalization? (2 marks)

c) Suppose relation $R(A,B,C,D,E)$ has following functional dependencies:

$AB \rightarrow C$
$D \rightarrow A$
$AE \rightarrow B$
$CD \rightarrow E$
$BE \rightarrow D$

Find all the candidate keys of R justify your answer. (8 marks)

d)

staffNo	DoctorName	PatientNo	PatientName	Appointment Date time	SurgeryNo
S1011	Smith	P100	Gihan	13-Aug 10.00	S10
S1011	Smith	P105	Juli	15-Aug 12.00	S15
S1024	Helen	P109	Navaneethan	04-Sep 10.00	S10
S1024	Helen	P109	Navaneethan	12-Sep 10.00	S10
S1032	Robin	P105	Juli	14-Oct 16.30	S15
S1032	Robin	P110	John	15-Oct 13.00	S13

i. Which normal form is this relation in? Justify your answer. (2 marks)

ii. Decompose above relation until third normal form. Clearly show all dependencies based on given data in the table and state the reasons for each decomposition. (6 marks)

(HINT: Consider the appointment Date time as separate attributes)

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