

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATIONS-2022

B.Tech-III Semester (CSE &IT)

COURSE CODE (CREDITS): 18B11CI313(4)

MAX. MARKS: 15

COURSE NAME: DATABASE MANAGEMENT SYSTEMS

MAX. TIME: 1 Hour

COURSE INSTRUCTORS: Dr. P.K. Gupta, Dr. Hari Singh, Dr. Amit Kumar, Dr. Monika Bharti

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1. Consider the following relations S1 (P, Q, R) and S2 (P, R) and the given instances. What is the result of the relational algebra expression  $S1 \div S2$ ? Justify your answer. [CO2] [3]

S1

P	Q	R
1	2	2
1	4	2
2	4	4
1	6	2
2	2	4

S2

P	R
1	2
2	4

Q2. Consider the following given schemas with their data types: [CO2] [3]

Student(sid: integer, sname: string)  
 Course(cid: string, iid: integer, cname: string)  
 Instructor(iid: integer, iname: string)  
 Grades(sid: integer, eid: string, grade: string)

Design the following given queries by using various notations used in Relational Algebra:

- Find the name of the students who have registered in the course with cid CS44800
- Find the ids of the students who never received a grade F.
- Give a list of all people (Instructors and Students), with their ID and name

Q3. Consider the following expressions, which use the result of a relational algebra operation as the input to another operation. For each expression, explain in words what the expression does. [CO2] [3]

- $\sigma_{year \geq 2009}(takes) \bowtie students$
- $\sigma_{year \geq 2009}(takes \bowtie students)$
- $\pi_{ID, name, course\_id} = (students \bowtie takes)$

**Q4.** The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:

- Patients are identified by an SSN, and their names, addresses, and ages must be recorded.
- Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Every patient has a primary physician. Every doctor has at least one patient.
- Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.
- Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
- Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

*Answer the following:*

- a) Draw an ER diagram that captures the preceding information. [CO3] [2+1]
- b) Identify the various attributes that makes the key for each relation.

**Q5. State the reason for following:**

- a) We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets? [CO1] [3]
- b) Consider an E-R diagram in which the same entity set appears several times. Why is allowing this redundancy a bad practice that one should avoid whenever possible?
- c) A weak entity set can always be made into a strong entity set by adding to its attributes the primary key attributes of its identifying entity set. Outline what sort of redundancy will result if we do so.