

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | IV / II | Time | 3 hrs. |

Subject: - Database Management System (Elective II) (CT76506)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Describe the different levels of abstraction in database. What is the significance of physical data independence? [3+1]

2. Draw a complete ER-diagram for the following case.

“A lecturer (having an ID, name and room number) is responsible for organising a number of course modules. Each module has a unique code and also a name and each module can involve a number of lecturers who deliver part of it. A module is composed of a series of lectures and sometimes lectures on a given topic can be part of more than one module. A lecture has a time, room and date and is delivered by a lecturer and a lecturer may deliver more than one lecture. Students, identified by number and name, can attend lectures and a student must be registered for a number of modules. We also store the date on which the student first registered for the module. Finally, a lecturer acts as tutor for a number of students and each student has only one tutor.”

Distinguish between weak and strong entity set along with example. [8+4]

3. Consider the following relational database model

Employee(eid, name, address, supervisor_eid)
 Department(dept_id, name)
 Project(pid, title, dept_id)
 Works_on(eid, pid, hours)

Write relational algebra expressions for the following: [2×4]

- a) List the titles of all projects along with the department name.
- b) Find the total number of hours each employee works along with his/her name.
- c) Delete all projects which belong to the “Computer” department.
- d) Insert a new record for Chemistry department with dept_id as 123.

4. Consider the relational schema given below. [2×4]

Hotel (Hotel_No, Name, Address)
 Room (Room_No, Hotel_No, Type, Price)
 Booking (Hotel_No, Guest_No, Date From, Date_To, Room_No)
 Guest (Guest_No, Name, Address)

- a) Write an SQL query to list all guests who have booked rooms at the Himalayan Hotel.
- b) Write an SQL query to create a view to expose only the Hotel_Name, Room_No and Price of the room of all booked rooms.
- c) Write a query to increase the Price of all rooms by 10%.
- d) Write skeleton tables in QBE to find the Check-in date and Name of all guests currently booked for the Everest Hotel.

5. a) Formally define a functional dependency along with an example. State the Armstrong's axioms to compute the closure of functional dependencies. [3+3]
b) Describe what BCNF is. Compare BCNF and third normal form. [4+2]
6. Briefly explain the general steps for query processing by a DBMS. Distinguish between cost-based optimization and heuristics based optimization. [4+4]
7. a) Explain the working of sparse sequential index along with an example. [4]
b) Explain how variable length records can be implemented in databases. [4]
8. Explain the ACID properties of transaction along with examples. Explain the two-phase locking protocol for concurrency control. [4+4]
9. Explain the idea of a stable storage. How does log-based crash recovery work? Explain briefly. [2+4]
10. Write short notes on the following: [2×3]
 - a) Object-Relational Mapping (ORM)
 - b) Heterogeneous distributed databases
