DBMS

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Notes

- PYQs of BEI's CT610, BCT's CT652 are combined.
- PYQs of BEI's CT610's are styled as `this font in order to say that these are our syllabus' pyq's`.
- PYQ of BCT with no subject code mentioned in the question paper, starting from 2068 Magh and earlier, will be *stylized as italic to differentiate them*

Contents

1 Introduction

(3 Hours/4 Marks)

1.1 Concepts and Applications

1. Define data [1.5] (**81 Bh**) [0.5] (**80 Bh**,**79 Ch**)
2. Define DBMS [1.5] (**81 Bh**) [1] (81 Ba) [0.5] (**80 Bh**,**79 Ch**)
3. Distinguish between a database and a DBMS. [2] (71 Ma)
4. Mention the advantages of DBMS over file processing system, explain briefly.
   [3] (**79 Ch**) [4] (**74 Bh**)
   |→What difficulties would you face if you used file system directly to implement a database application? [3] (**71 Bh**)
   |→Drawbacks of file system. [4] (72 Ma) [6] (**68 Bh**)
   |→Disadvantages of conventional file system? [2] (76 Ba)
   |→What are the advantages of DBMS? [3] (**79 Bh**)
5. Briefly highlight differences between file-processing system and a DBMS.
   [2] (**80 Bh**) [4] (**76 Bh**,**69 Bh**)
   |→Specifically asked to list and explain 5. [5] (**67 Mng**)
6. Explain the advantages of using Relational DBMS. [4] (**80 Ch**)
7. Explain four components of DBMS. [4] (81 Ba)
8. List roles and responsibilities of Database Administrator. [2] (**79 Bh**)

1.2 Objective and Evolution

1. What are the latest trends in Database Management? [2] (**81 Bh**)

1.3 Data Abstraction and Data Independence

1. Define the terms Data Abstraction and Data Independence. [2] (**78 Ch**)
2. Define Data Abstraction. [1] (75 Ba, 73 Ma)
3. Define data independence and explain its significance. [2] (76 Ba)
4. Why are abstraction and independence important in DBMS? [3] (**78 Ch**)
5. Mention the different levels of data abstraction and explain. [2] (**75 Bh**) [4] (**70 Bh**, 68 Ma)
6. Explain data abstraction different levels with suitable example.
   [2] (**80 Ch**,**77 Ch**) [3] (75 Ba, 73 Ma) [4] (70 Bh)
7. Why is data independence important in data modeling? [2] (**73 Bh**,**72 Ash**)
8. Differentiate between physical and logical data independence. [2] (80 Ba, 72 Ash)
9. What is physical data independence? [1] (**71 Bh**)

10. Why is physical data independence important in data modeling? [2] (**77 Ch**)
11. What is the advantage of separating the logical and physical level in database design?[2] (71 Ma)
12. List and explain all the aspects of database system that might be subjects to change in physical storage. [6] (65 Ka)

1.4 Schema and Instances

1. What do you mean by scheme and instances? [2] (**75 Bh**, 81 Ba)
2. Differentiate between schema and instances. [2] (**73 Bh**, 76 Ba)
3. Explain three schema architecture in DBMS. [2] (81 Ba)
   |→(Assumed) Explain z-tier architecture in DBMS. [2] (**80 Bh**) (Author's note: *This would make perfect sense if it was 3-tier, but original had z-tier*)

1.5 Concepts of DDL, DML and DCL

1. Define DDL, DML, DCL with examples. [3] (80 Ba)
2. Explain the difference between DDL, DML and DCL along with examples. [4] (70 Ma)
3. What is data definition language? [1] (***67 Mng***)

2 Data Models

(7 Hours/12 Marks)

1. What are data models? Explain various types of data models. [1+3] (73 Ma)
2. Explain the relational model of database system along with foreign key constraint with appropriate example. [4] (**79 Ch**)
3. Explain how network data model is different from relation data model. [4] (72 Ma)

2.1 Logical, Physical and Conceptual

2.2 E-R Model

1. Define unary relationship along with example. [2] (**75 Bh**)
2. How do you convert an ER relationship into relation schema? Explain with examples of different cardinalities. [4] (**75 Bh**)
3. Describe what is total participation using an ERD example. [4] (70 Ma)
4. Differentiate total and partial participation with suitable example. [4] (**73 Bh**)
5. What is importance of aggregation in ER design? Discuss with an example. [2] (76 Ba)
6. Define generalization and specialization with its notation and examples. [4] (**80 Ch**, 71 Ma)
7. Mention the distinctions among the terms Generalization and Specification with appropriate symbolic representation. [4] (**76 Bh**)

2.3 Entities and Entities sets

1. Explain strong and weak entity sets along with example. [4] (***67 Mng***, 75 Ba)

2.4 Strong and Weak Entity Sets

1. What is the difference between strong and weak entity sets? [4] (**72 Ash**,**70 Bh**)

2.5 Attribute and Keys

1. Define Attributes and explain its type with example. [4] (**80 Bh**)
2. Define attribute and its types, entity, participation constraint, weak entity set. [3] (81 Ba)
3. How do you represent composite and multivalued attributes of ERD in tables? Explain with example. [4] (*65 Ka*)
4. What is keys and explain different types of keys. [2] (80 Ba)
5. Explain different keys used in database design. [2] (**74 Bh**)
6. What is key attribute? List out the types and explain them briefly. [3] (**79 Bh**)

2.6 E-R Diagram

1. Differentiate between degree with the cardinality of a relationship in an ER diagram. [2] (**81 Bh**,**77 Ch**) [4] (**71 Bh**,**69 Bh**)

2. Explain briefly about generalization in context to ER diagram with an example. [2] (**81 Bh**,**77 Ch**)

3. Define discriminator in ER diagram. [2] (**74 Bh**)

4. A General Hospital consists of a number of specialized wards (such as Radiology, Oncology, etc). Information about ward includes unique name, total numbers of current patients. Each ward hosts a number of patients, who were admitted by a consultant (doctors) employed by the Hospital. On admission, the date and time are kept. The personal details of every patient include name, Medical Record Number (MRN), set of phone number and one address (city, street, code). A separate register is to be held to store the information of the tests undertaken. Each test has unique episode number, category and the final result of test. Number of tests may be conducted for each patient. Doctors are specialists in a specific ward and may be leading consultants for a number of patient. Each patient is assigned to one leading consultant but may be examined by other doctors, if required. Drawn an ER diagram for the above case implementing necessary design constraints. [8] (**81 Bh**)

5. Also construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time and has an associated due date, and the date when the payment was received. [5] (81 Ba)

6. List the entities, attributes and their relationships and draw an ER diagram for the university database. "A lecturer, identified by their number, name and room number, is responsible for organizing a number of course modules. Each module has a unique code and also a name and each module can involve a number of lectures and because of economic constraints and common sense, 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 name and number, can attend lectures and a student must be registered for a number of modules. We also store the date on which the students first registered for that module. Finally, a lecturer acts as a tutor for a number of students and each student has only one tutor." [8] (**80 Bh**)

7. "A football club has a name and a ground and is made up of players. A player can play for only one club and a manager, represented by his name manages a club. A footballer has a registration number, name and age. A club manager also buys players. Each club plays against each other club in the league and matches have a date, venue and score." Create an ER diagram for above scenario. [8] (80 Ba)

8. Design an E-R diagram for a company human resource database, "The company has a set of branch offices. Each branch office has a set of departments. Each department has a set of employees, a set of projects. Each employee has a job history, academic qualification. For each type, the employee also has a salary history." [7] (**79 Bh**)

9. Consider the database of departmental store. There are various departments in the store. One department sales many items. Some items maybe sold by more than on department. A department

has many employee. An employee can belong to at most one department. A manager is an employee who may look after more than one department but a department maybe looked after by only one manager. A unique number called internal_item_no. is assigned to every item by store. A supplier may supply more than one item. Every item is supplied by only one supplier at a time. Consider the necessary attributes and keys of entity and construct ER diagram. [8] (**80 Ch**)

10. A relational database is to be designed for a medium sized company dealing with industrial applications of computers. The company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software. The Company employs various expert, consultants and supporting staff. All personnel are employed on long-term basis, i.e. there is no short-term or temporary staff. Although the company is somehow structured for administrative purposes (i.e., it is divided into departments headed by department managers) all projects are carried out in an inter-disciplinary way. For each project a project team is selected, grouping employees from different departments, and a project manager (also an employee of the company) is appointed who is entirely and exclusively response for the control of the project, quite independently of the company's hierarchy. Construct an ER diagram with appropriate constraints for the case above. [8] (**79 Ch**)

11. An university Registrar's Office maintains data about the following entities:
    i) Courses, including number, title credits, syllabus and prerequisites;
    ii) Course Offerings, including course number, year, semester, section number, instructors, timings, and classroom;
    iii) Students, including student id, name and program;
    iv) Instructors, including identification number, name department and title.
    Further, the enrollment of students in course and grade awarded to students in each course, they are enrolled for most be appropriately modelled. Construct an E-R diagram for the Registrar's office. Document all assumptions that you make about the mapping constraints. [8] (**78 Ch**)

12. Draw an ER diagram for an online book store that contains written by authors and published by the publisher. Also the book is stocked in the warehouse. The store also maintains record about the selling of books online via shopping basket (shopping cart), i.e. customers purchase the books online via the shopping basket. Books have ISBN, price, title and year whereasauthors may have url, name, address and email. Also the publishers name, address, phone no. and url are stored. The customer's name, address, email and phone stored. The warehouse and may have code, phone no. and address. Assume other parameters accordingly. [8] (**77 Ch**)

13. Draw an E-R diagram for the given case. [8] (76 Ba)
    A company having a chain of pharmacies wishes you to design a database for the company. 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, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical 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 atleast one patient. Each pharmacy sells several drugs and has a price for each. 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.

14. Draw the ERD with appropriate mapping cardinalities for the MAIL_ORDER database in which employee take orders for parts. The mail order company has employees, each identified by unique employee take orders for parts. The mail order company has employees, each identified by unique employee number, first name, last name and ZIP code. Employee are categorized as manager, clerk and delivery staff. Each customer of the company is identified by a unique employee number, first and last name and ZIP code. Each part sold by the company is identified by unique part number, part name, price and quantity stock. Each order placed by a customer is taken by clerk and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded. The delivery boy places the order of specified customers. There is a provision of replacing one or many fault parts to the customer but before that it must be verified by manager. [8] (**76 Bh**)

15. Identify relevant attributes and construct an ER diagram with proper mapping constraints for a university which has many departments and each department has multiple instructors; one among them is head of the department. An instructor belongs to only one department, each department offers multiple courses, each of which is taught by a single instructor. A student may enroll for many courses offered by different departments. [6] (**75 Bh**)

16. Construct an ER-Diagram for the following NFL database. [8] (75 Ba)
You are given the requirement for a simple database for the National Football League (NFL). The NFL has many teams, and each team has a name, a city, a coach, a captain and a set of players. Each player belongs to only one team and each player has a name, a position (such as left wing, mid fielder or a goalkeeper) a skill level, and a set of injury records. A team captain is also a player and a game is played between two teams (referred as host team and guest team) and has a match date (such as June 11, 2018) and score (such as 2 to 5).

17. Draw the ERD with appropriate mapping cardinalities for the following scenario. [8] (**74 Bh**)
A Production company consists of a machining, fabrication and assembly department. Employee has at most one recognized skill, but a given skill may be possessed by several employees. An employee is able to operate a given machine-type (e.g. lathe, grinder, welding) of each department. Some of the employees are paid overtime and some of them are paid with daily basis. According to their designation (e.g. mechanic, welder) are supposed to maintain at least one machine-type of their department. Raw materials are bought from different vendors and fetched to fabrication department and so on. Many parts are assembled together to form a product. The final products from assembly department are stored in the warehouse. Products are labeled with different specifications (e.g. Product_ID, Product_type, MRP, etc).

18. Design an ERD for a database for an airlines system. The database must keep track of customers and their reservations, flights and their status, seat assignments on individual flights and the schedule and routing of future flights. Apply all the database design constraints as much as possible. [8] (73 Ma)

19. Draw an ERD for the airport database. Be sure to indicate the various attributes of each entity. Every airplane has a registration number and each airplane is of a specific model. The airport

accomodates a number of airplane models and each model is identified by a model number (eg DC-10) and has a capacity and a weight. A number of technician works at the airport. You need to store the name, SSN, address, phone number and salary of each technician. Each technician is an expert on one or more plane model(s) and their expertise may overlap with that of other technicians. This information about technicians must also be recorded. Traffic controllers must have an annual medical examination. For each traffic controller you must store the data of the most recent exam. [8] (**73 Bh**)

20. An information system is to be designed for keeping the records of Universe Cup Cricket Tournament. There are 10 teams participating in the tournament. Each country sends 15 players and 4 other members. For players, the runs he scores and the number of wickets taken (so far) are to be rerecorded. For non-players, the role (manager, coach, etc) and the number of years of experience are recorded. There are matches scheduled among the teams on several grounds on fixed dates. Each ground has fixed seating capacity and a size. For 38 matches, 11 referees have been assigned. Each match will have 3 referees. The performance of every player in every match is to be recorded in terms of runs he scored and wicket he took. Draw E-R model of the system. [8] (72 Ma)

21. Draw an ERD for the following mini-case. [8] (**72 Ash**)
Patients are treated in a single ward by the doctors assigned to them. Healthcare assistants also attend to the patients; a number of these are associated with each ward. Each patient is required to take a variety of drugs a certain number of times per day and for varying lengths of time. The system must record details concerning patient treatment and staff payment. Some staffs are paid part time and doctors and healthcare assistants work varying amounts of overtime at varying rates, the system will also needed to track what treatments are required for which patients.

22. Draw a complete ER-diagram for the following case. [8] (71 Ma)
A lecturer (having on ID, name and room number) is responsible for organizing a number of course modules. Each module has a unique code and also a name and each module can involve 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 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 that module. Finally, a lecturer acts as a tutor for a number of students and each student has only one tutor.

23. A Bus Company owns a number of buses. Each bus is allocated to a particular route, although some routes may have several buses. Each passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a garage where buses are kept and each of the buses are identified by the registration number and can carry different numbers of passengers, since the vehicles vary in size and can be single or double decked. each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers have an employee number, name, address, and sometimes a telephone number."
[8] (**71 Bh**)

24. Assume that at Pine Valley Furniture each product (described by Product No., Description, and Cost) is comprised of atleast three components (described by Component No., Description, and Unit of Measure) and components are used to make one or many products (i.e. must be used in atleast one product). In addition, assume that components are used to make other components and that raw materials are also considered to be components. In Both cases of components being

used to make other components, we need to keep track of how many components go into making something else. Draw ERD for this. [8] (70 Ma)

25. Draw an ERD for the following case. [8] (**70 Bh**)
Each employee in an engineering company has at most one recognized skill, but a given skill maybe possessed by several employees. An employee is able to operate given machine-type (e.g., lathe, grinder) if he has one of several skills, but each skill is associated with the operation of only one machine type. Possession of a given skill (e.g., mechanic, electrician) allows an employee to maintain several machine-types, although maintenance of any given machine-type requires a specific skill (e.g., a lathe must be maintained by a mechanic).

26. A university registrar's maintains data about the following entities: (a) Courses, including number, title, credits, syllabus and prerequisites; (b) Course offerings, including course number, year, semester, section number, instructor(s), timings and classroom; (c) Students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. [8] (**69 Bh**)

27. Patients are treated in a single ward by the doctors assigned to them. Healthcare assistants also attend to the patients, a number of these are associated with each ward. Each patient is required to take a variety of drugs a certain number of times per day and for varying lengths of time. The system must record details concerning patient treatment and staff payment. Some staff are paid part time and doctors and healthcare assistants work varying amounts of overtime at varying rates. The system will also need to track what treatments are required for which patients.
[8] (*68 Ma*)

28. Drawn an ERD for this case: [8] (***68 Bh***)
Procurement department of the Ministry of Transportation (MOT) keeps track of all the items (furniture and equipment such as a chair or printer) in the Ministry Offices. There are several MOT buildings and each one is given a different name to identify it. Each item is assigned to a random within a building. Each room within a building is assigned to a department, and each department has a single employee as it's manager.

29. Construct an ERD with propoer mapping constraints for Registrar's Office that maintains data about courses, course offerings, students and instructors, enrollment of students in various courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.
[5] (***67 Mng***)

30. Construct an ERD with proper mapping constraints, attributes and relationship sets for book shopping center that has entity sets book, author, publisher, customer, shopping-basket and warehouse. [4] (*65 Ka*)

2.7 Alternate Data Model (hierarchical, network, graph)

3 Relational Languages and Relational Model

(7 Hours/12 Marks)

3.1 Introduction to SQL

3.2 Features of SQL

3.3 Queries and Sub-Queries

3.4 Set Operations

1. Mention the two conditions to be satisfied by any two sets for union, intersection and set difference operation between them. [1] (**69 Bh**

3.5 Relations (Joined,Derived)

3.6 Queries under DDL and DML Commands

3.7 Embedded SQL

3.8 Views

1. Explain view with example. [3] (81 Ba)
2. How is view different from table? [2] (81 Ba)
3. Suppose you are assigned as the Database Administrator of a Bank. How can you enhance the security by implementing concept of views on the database? [3] (**69 Bh**)

3.9 Relational Algebra

3.10 Database Modification

3.11 QBE and domain relational calculus

3.12 Numericals

All sub-questions are worth 2 marks. Each question is not individually stated with their year as it would be insignificant to read what year they are from and to save time on the authors' parts.

1. Consider the relation: (**81 Bh**)
   Employee(<u>empid</u>, ename, address, title, headid)
   Project(<u>id</u>, ename, budget, location)
   Work(empid, pid, responsibility, duration)
   Payment(<u>title</u>, salary)

   - SQL queries:

   a. Write SQL code io create the above relational schemas.
   b. Write SQL to count the number of project with duration more than 2 years.
   c. Write SQL query to find the name of engineers working in ICT project and earning more than 20K.

d. Write SQL to update the salary of employees by 15% if salary is less than 50K, by 10% if salary is in between 50K and 100K and by 5% if greater than 100K.

2. Consider the relation: (**80 Ch**)

PERSON(licenseNo, name, address)
CAR(modelNo, brand, year)
ACCIDENT(reportNo, date, location)
OWNS(licenseNo, modelNo)
PARTICIPATED(licenseNo, reportNo, damageAmount)

- SQL queries:

a. Display all the detail of a Person whose name ends with 'ta' and is involved in some accident.
b. Display the license numbers and location where the accident took place on Jan 20, 2020.
c. Update the brand name "BMW" to "BMW-X" for car manufactured in year 2020.
d. Create a view named PERSON_REPORT which contains licenseNo, Name and reportNo as its members where the damage amount is less than or equal to 100,000.

3. Consider the relation: [8] (**79 Ch**)
Doctor(name, age, address)
Works (name, dept no)
Department (dept no, floor, room)

- SQL queries:

a. To display the records of doctor with their department information.
b. To find total number of rooms assigned in each floor.
c. To display the name of doctor with maximum age.
d. To delete the records of doctors whose name start with 'M' and works in 10^{th} floor.

4. Consider the relation: (76 Ba)
Product (Pid, Pname, Price, description)
Customer (Cid, Cname, Address)
Sells (Pid, Cid, quantity) - SQL queries:

a. Retrieve the record of product who were sold to customer id 12.
b. Create above table product as indicated.
c. Find the product whose sells quantity is maximum.
d. Find the total number of customer whose name starts with S.

5. Consider the relation: (**75 Bh**)
Student (crn, name, address, phone, dob)
Course (courseid, crn, duration, fee)
Enroll (enrolled, cname, courseid, enrolldata, completedata)

- SQL queries:

a. create the above relations, including appropriate versions of all primary and foreign key integrity constraints
b. to find crn, names and enroll data of all students who have taken the course 'java' (cname)
c. find the names and address of all the students who have taken both course java and linux.
d. create a view 'student_course' having the attributes crn, name, phone, coursename, enrolldata.

6. Consider the following relation: (75 Ba)
   tblsalesman(s_id, name, city, commission)
   tblOrders(ord_no, prch_amt, ord_date, c_id, s_id)
   tblCustomer(c_id, name, city, grade, s_id)

   - SQL queries

   a. find those salesmen with all information whose name containing the 1st character is 'N' and the 4th character is 'R' and rests maybe any character.
   b. find the highest purchase amount on a date '2017-07-17' for each salesman with their ID.
   c. count the customers with grades above Kathmandu's average.
   d. Increase commission of salesmen by 2% if they are from humla.

7. Consider the relation: (**74 Bh**)
   Employee (empid, ename, age, salary)
   Department (deptid, dname, budget, managerid)
   Works (empid, deptid, hourse)

   - SQL query to

   a. to create the above relations, including appropriate versions of all primary and foreign key integrity contraints.
   b. to find the name of department whose employee earns the maximum salary.
   c. to find the name of the employee, department name and the number of hours, they work.
   d. Write an expression in SQL to give every employee a 20% raise in salary whose age is in between 45 to 50 years

8. Consider the following relational schema [2x4] (**81 Bh**,**80 Ch**)
   Employee(empid, ename, address, title, headid)
   Project(pid, ename, budget, location)
   Work(empid, pid, responsibility, duration)

   - RAE Queries

   a. Write relational algebra to find the name and salary of employees working in 'kathmandu'.
   b. Write the relational algebra to show the employee name along wiith their head name.
      Note: the data in headid is empid of their corresponding head
   c. Write relational algebra to display the details of those employees who live in the same location of their project.
   d. Write relational algebra to display employee's title, name along with their project name, salary if the project duration is more than 5 years.

9. Consider the following relational database. [8] (**79 Ch**)
   Client (Cid, Lid, Cname, birthYear, caseField)
   Lawyer (Lid, Fname, Lname, Specialty, Salary, startingYear)
   Firm (Fname, City, managerName)

   - RAE queries:

   a. Write relational algebra expression to find names of clients that were born after 1980 and their case field was "Traffic"
   b. Write relational algebra expression to find names of clients who were presented only by lawyers whose salary is at 8000.
   c. Write relational algebra expression to find all pairs of client id and firm name such that no lawyer of that law firm presented this client and this client had some case in a field other than "Divorce".

d. Write a QBE expression to find lawyer's name whose salary is more than Rs. 50,000 and starting year is 1990.

10. Consider following relations and write relational algebra. [8] (76 Ba)
Emp (Eid, Ename, Address, Salary, Dptid)
Depart (Dptid, Dname)

- RAE to:

a. Insert a single record in Emp table (100, 'Ram', 'Balaju', 10000, 5)
b. Retrieve the record of employee who earns more than 10000 in computer department.
c. Increase the salary of all employee by 10 percent.
d. Delete all the record of employee who are from ELX department. (Dptid = "ELX")

11. Consider the following relations and write RAE to: [8] (**75 Bh**)
sailor (sailorid, sname, rating, age)
boat (boatid, boatname, color)
reserves (sailorid, boatid, date)

- RAE to:

a. find the names of sailor who has reserved boat number 105.
b. find the names of sailors who have reserved a red boat.
c. find the names of all sailor who have reserved either a red boat or a green boat.

- Give an expression in QBE to find the sailors name and age who have reserved a red boat.

12. Consider the relational algebra: (75 Ba)
Author(a_name, citizenship, birthYear) Book (isbn, title, a_name)
Topic(isbn, subject) Branch(libname, city)
Instock(isbn, libname, quantity)

- RAE to:

a. give the cities where each book is held.
b. give the title and author of each book of which atleast two copies are held in a branch located in Kathmandu.
c. Delete those books that are from author 'xyz'.
d. List total no. of available books of each subject.

13. Consider the relation: (**74 Bh**)
Account (account-number, branch-name, balance)
Branch (branch-name, branch-city, assets)
Customer (cust-name, cust-street, cust-city)
Loan (loan-number, branch-name, amount)
Depositor(cust-name, account-number)

- RAE to:

a. find the names of customers who has loan at "Koteshwor" branch.
b. find the largest account balance.
c. find the names of all depositers along with their account number, street and city address.

- QBE to:

a. find the customer name, loan number and amount for all customers who ahve a loan from the "Koteshwor" branch.

14. Consider the realtional database as follows: [2x6] (81 Ba)
department(*dept name*, building, budget)
Course(*course id*, title, dept_name, credits)
instructor(*ID*, name, dept_name, salary)
section(*course id, sec id, semester, year*, building, room_number, time_slot_id)
teaches(*ID*, name, dept_name, total_credit)

- SQL queries:

a. Add a check constraint in semester attribute. [winter, fall, spring, summer] of table "section".
b. Find the names of all instructors that have a salary value greater than that of each instructor in the Computer department.
c. Find the list of the entire department relation in descending order of budget. If several departments have the same budget, order them in ascending order by department name.
d. Delete the records of all instructors with salary below the average at the university.
e. Update all instructors with salary over 10,00,000 receive a 5 percent raise, whereas all other receive a 10 percent raise.

- RAE queries:

a. Find the name of student whose department name and total credit are same as Shyam's department name and total credit.

15. Consider the employee database schema [2x6] (**80 Bh**,**68 Bh**)
employee(employee name, street, city)
works(employee name, company name, salary)
company(company name, city)
manages(employee name, manager name), where the primary keys are underlined.

-SQL and RLA queries:

a. Find the names and cities of residence of all employees who work for the First Bank Corporation.
b. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000 and employee name and must not start with the letter "z".
c. Find all employees in the database who do not work for First Bank Corporation.
d. Find all employees in the database who earn more than each employee of Small bank Corporation.
e. Assume that the companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located.
f. Find the company that has the most employees.

- RAE:

a. Find the names and street address of all employees who work for First Bank Corp. and earn more than $10,000 per annum.
b. Find the names of all employees who do not work for First Bank Corp.
c. Give all employees working at First Bank Corp. a 10% salary raise.
d. Count the number of employees in each company.

16. Consider the follwoing insurance database.
PERSON (licenseNO, name, address)
CAR (modelNo, brand, year)
ACCIDENT (reportNo, date, location)

OWNS (licenseNo, modelNo)
PARTICIPATED (licenseNo, reportNo, damageAmount)

- SQL queries: [4x2] (80 Ba)

a. Find the Person detail whose name starts with 'A' and is involved in some accident.
b. Find the car details that are involved in accident and calculated more than 40,000 as a damage amount.
c. Delete the information of car which is owned by person living in Humla
d. Create a view named PERSON_REPORT which contains licenseNo, name and reportNo as its member and the person's address is Ktm.

- RAE queries: [4x2] (80 Ba)

a. Find the Person name and car they own and the car was manufactured on 2010.
b. Find the total number of accidents occurred on Jan 20, 2022 location wise.
c. Find the details of accident where the damage amount exceeds 50,000.
d. Find name of all person who met an accident.

17. Consider the following relational database model: [2x4x2] (**79 Bh**)
Product (product_id, pname, price, pdescription)
Customer (customer_id, cname, address, phone)
Purchase (product_id, customer_id, quantity, sales_mid)
Salesman (sales_mid, sname, salary)

- SQL queries:

a. Create table Purchase (use foreign key)
b. List name and address of all customers who purchased the product SSD.
c. Find the name of the product which purchase quantity is maximum.
d. Increase the salary of all salesman by 5% who have sold atleast 10 SSD.

- RAE queries:

a. Display name of the customers who are from Kathmandu and name start with 'R'.
b. List the name of the product purchased by customer 'Sita' from the salesman 'Ram'.
c. Find the product wise total purchased quantity.
d. Update the price of all products by 8%.

18. Consider the following relational database model. [2x4x2] (**78 Ch**)
Passenger (pid, pname, pgender, pbirthplace)
Agency (aid, aname, acity)
Flight (fid, fdate, time, source, destination)
Booking (pid, aid, fid, bookdate, amount)

- SQL queries:

a. Find all the passenger details who are travelling from "Kathmandu" to "Pokhara".
b. Update the booking amount with 10% discount if the flight destination is same as the passenger's birth city.
c. Create a View named "EsewaReport" in which calculate the total amount of booking made in the current date through the agency having name "Esewa".
d. List Flight wise total number of bookings for current date.

- RAE queries:

a. Find the details of all flights to "Kathmandu".

b. Find name of all passengers who have booked atleast one flight.
c. List the name of all agencies who have made highest booking till date.
d. Find all the passenger who have booked from agency "Esewa".

19. Consider the relational model. [7x2] (**77 Ch**)

Employee (empid, empname, address, title)
Project (pid, pname, budget, location)
Assignment (empid, pid, responsibility, duration)
Payment (title, salary)

- SQL queries:

a. Count the number of project with duration more than 2 years.
b. Find the name of engineers working in ICTC project and earning salary more than 20K.
c. Update the salary of employees by 5% if salary less than 10k, by 7% if salary between 10K and 20K and by 9% if salary greater than 20K.

- RAE queries:

a. Find the projects having budget more than 500K.
b. List the employees working for more than 10 years in CAD/CAM project.
c. Find the name and salary of employees working ni Kathmandu.

- Give an expression in QBE to find the employee name and address who have salary greater than 50K.

20. Consider the following relational data model [2x4x2] (**76 Bh**)

Employee (empid, empname, address, title)
Project (pid, proj_name, budget, location)
Assignment (empid, pid, responsibility, duration)
Payement (title, salary)

- SQL query:

a. find the name and salary of Engineers.
b. find the name of employee working in projects in their own city.
c. create a view named empdetailas with empname, address, proj_name and salary.
d. to find the names of employees who works in "CAD/CAM" project.

- Write RAE to:

a. find the name of employees working for more than 2 years in "Software" project and earning more than 1000K.
b. find the names of employees working in "PCB Fabrication" project other than John.
c. find the salaries of Engineers working in "Fabrication" project other than John.

- Give an expression in QBE to find the employee name and address of "Engineers" who have salary greater than 50K.

21. Consider the relation: (73 Ma)

Employee(empid, name, address, manager_id)
Department(deptid, dname)
Project(pid, title, budget, deptid)
Works_on(empid, pid, hours)

- SQL query to:

a. find the name of employees who work on project with the highest budget.

b. create a view tih empid, name, project title and budget.
c. update the budget of all project by 20% where any employee works for more than 12 hours.

- RAE to:

a. find the names of all employee from computer department along with their manager name.
b. Find the names of all the employees who works on project with budget more than 50000.
c. Find the total number of projects from each department along with the department name.

22. Consider the relation: (**73 Bh**)

Employee (Ename, street, city)
Works (ename, company_name, salary)
Company (company_name, city)
Manages (Ename, manager_name)

- SQL query to:

a. Create Employee and Wors relation with primary key and foreign key constraints.
b. Find the employee name their company name and city name which ends with 'pur' as sub-string.
c. Increase the salary of each employees by 25% whose salary is less than 30000.

- RAE to:

a. Find all the employees name who work in 'NMB bank'.
b. Find all the employee names who lives in the same city as their company is located.
c. Find the name and city of those employees whose salary is greater than 30000 and lives in 'ktm' city.

23. Consider the relation: (72 Ma, 68 Bh)

Account (account_number, branch_name, balance)
Branch (branch_name, branch_city, assets)
Customer (Customer_name, customer_street, customers_city)
Loan (loan_number, branch_name, amount)
Depositer (customer_name, account_number)
Borrower (customer_name, loan_number)

- SQL query to:

a. list all the customers details, branch details and account details according to account number.
b. list the branch name where the average account balance is more than 50,000.
c. increase all accounts with balances over $10,000 by 5% and other accounts receive 6%.
d. list the names of all depositers along with their account number, street and city address.
e. list the branch-cities and total assets where the total assets are more than $1,000,000 in the city.
f. Find the names and loan-numbers of all customers who have a loan of over $15,000.
g. Increase all accounts with balances over $10,000 by 6%.
h. Delete all loans with loan amount between $1400 and $1700.
i. Find the name of all customers who have a loan at the bank but do not have an account at the bank.

- RAE to:

a. count the number of acconts in each branch.
b. delete all loans less than $1,000 in amount.

c. find the name of all customers who have a loan at KANTIPATH branch but do not have an account at any branch of the bank.
d. find the name of all customers who have a loan and an account at the bank.

- QBE to:

a. Provide gift for all loan customers of the PATAN branch, a new $200 savings account for every loan account they have, with the loan number serving as the account number for the new savings account.
b. Find the customer-name, loan-number, and amount for all customers who have a loan from the "PATAN" branch.

- Give an expression in the tupple relational calculus to find the name of all customers who have a loan and an account at the bank.
- Give an expression in domain relational calculus to find the name of all customers who have a loan of over $12,000.

24. Consider the relation: (71 Ma)
Employee(eid, name, address, supervisor_eid)
Department(dept_id, name)
Project(pid, title, dept_id)
Work_on(eid, pid, hourse)

- RAE to:

a. List the titles of all projects along with the department names.
b. Find the names of all employees who live in "Kathmandu" and are supervised by employee who also lives in "Kathmandu".
c. Increase the working hours of all employees who work in the "Voter registration" project by 5 hrs.
d. Find the total number of employees involved in each project along with the project title.

25. Consider the relation: (71 Ma)
Product (pid, name, price, category, maker-cid)
Purchase (buyer-ssn, seller-ssn, quantity, pid)
Company (cid, name, stock price, country)
Person (ssn, name, phone number, city)

- SQL to:

a. find the names of all Japanese companies which sell products of "Computer" category.
b. create a view to expose only the product id, name, category and maker country.
c. decrease the stock price of all makers of "LCD" category products by 1%.

- QBE:

a. Write skeleton tables in QBE to find the name and phone number of all persons who sold products of "Automobile" category.

26. Consider the relations: (**71 Bh**)
Employee(eid, name, address, supervisor_eid)
Department(dept_id, name)
Project(pid, title, dept_id)
Works_on(eid, pid, hourse)

- RAE to:

a. List the name of all employees from Computer department along with the name of their supervisor.
b. Find the name of all employees who work on the "Network monitoring" project for more than 15 hours.
c. Delete all projects which belong to the "Electrical" department.
d. Find the total number of projects from each department, along with the department name.

27. Consider the relations: (**71 Bh**)
Product (pid, name, price, category, maker-cid)
Purchase (buyer-ssn, seller-ssn, quantity, pid)
Company (cid, name, stock price, country)
Person (ssn, name, phone number, city)

- SQL to:

a. find the name and price of all products of "camera" category made in "Japan".
b. create a view to expose only the Buyer name, Seller name and product name from all transactions.
c. increase the price of all products from DELL company by 5%.

- QBE:

a. Write skeleton tables in QBE to find the name and phone number of all persons who purchased products of Laptop category with price greater than 80,000.

28. Consider the relations: (70 Ma)
Product (pid, name, price, category, maker-cid)
Purchase (buyer-ssn, seller-ssn, quantity, pid)
Company (cid, name, stock price, country)
Person (ssn, name, phone number, city)

- RAE to:

a. find the ssn and name of all people who have purchased products of category "telephone"
b. list the pid and name of all products which is more expensive than $5000 and made in China.
c. increase the price of all products of "television" category by 10%.
d. List the ssn and name of each seller along with the total quantity of products sold.

29. Consider the relations: (70 Ma)
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)

- SQL query to:

a. to list all guests who have booked rooms at the Himalayan Hotel.
b. to create a view to expose only the Hote_No, Guest_No, Room_No and Price of the room of all booked rooms.
c. Write a query to offer 5% discount on all rooms of type "Delux" for the Everest Hotel.

- QBS:

a. Write skeleton tables in QBE to find the Check-in date and Name of all guests currently booked for the Everest Hotel.

30. Consider the relations: (**70 Bh**, 67 Mng)

employee (employee-name, street, city)
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager-name)

- SQL query to:

a. Modify the database so that Jones now lives in city Pokhara.
b. Give all employees of 'NABIL Bank' a 10 percent raise.
c. Give all managers of 'NABIL Bank' a 30 percent raise unless the salary becomes greater than 100,000.
d. Delete employee who has maximum amount of salary.

(*5 questions of 3 marks each below*) - Write relational algebra to find the name of manager who manages the employee "Shakti"
- Write a SQL statement to find the name of all employees who live in the same cities and same streets as the employee "Achyut" and the same cities as the companies for which they work.
- Write the QBE for delete all employees and who work for "XYZ" company.
- Write an expression in tuple relational calculus to find the name of all employees who works for "ABC" company name and salary for employee with earning over 50,000.
- Write an expression in domain relational calculus to find the name of the employee, company name and salary for employee with earning over 50,000.

- The relation works has attribute company-name is primary key in relation company. How the relation between these two relations is preserved? Explain with solution with SQL query to achieve this relationship. [4]

31. Consider the relations: (**69 Bh**)

employee (empname, street, city)
works (empname, companyname, salary)
company (companyname, city)
manages (empname, managername)

- SQL query to:

a. create the table employee.
b. insert a row into the table works.
c. find the name and cities of resident of all employees who do not work for XYZ Pvt. Ltd.

- RAE to:

a. find the company name that has the highest number of employees.

32. Consider the relations: (68 Ma)

employee((person-name, street, city)
works (person-name, company-name, salary)
company (company-name, city)
manages (person-name, manager-name)

- RAE to:

a. Find the names and cities of residence of all employees who work for First Bank Corp.
b. Find the names of all employees who live in the same city as the company for which they work.

c. Modify the database so that the employee Jones now lives in Newtown.
d. Find the average salary offered by each company.

33. Consider the relations: (68 Ma)

account(account-number, branch-name, balance)
branch(branch-name, branch-city, assets)
customer(customer-name, customer-street, customer-city)
loan(loan-number, branch-name, amount)
depositor(customer-name, account-number)
borrower(customer-name, loan-number)

- SQL query to:

a. List the names of all depositors along with their account number and balance.
b. Write an SQL query to find the names of all customers who have a loan of over $12,000.
c. Increase all accounts with balances over $10,0000 by 6%, and all other accounts by 5%.
d. List the branch-names where the average account balance is more than $10,000.

- Give an expression in QBE to find the customer-name, account-number, and balance for all customers who have an account at "PATAN" branch.

4 Database Constraints and Normalization

(6 Hours/12 Marks)

4.1 Integrity Constraints and Domain Constraints

1. Define integrity constraints and domain constraints. [4] (80 Ba)
2. What do you mean by integrity constraints? [1] (72 Ma)
   |→What are integrity constraints in a database? [3] (71 Ma)
3. Explain any four constraints that can be enforced to database tables. [4] (72 Ma)
4. List the various integrity constraints and explain about the referential integrity along with an example. [3] (75 Ba)
5. Define Domain constraint and Referntial Integrity constraint with an example. [4] (**74 Bh**)
6. Explain about refernital integrity constants and illustrate with suitable examples. [3] (**77 Ch**)
7. Explain what is referential integrity constraint along with an example? [3] (**71 Bh**)
8. Briefly explain cascading actions in referential integrity constraints. [3] (**71 Bh**)

4.2 Assertions and Triggering

1. Define Assertion with its SQL syntax. [2] (**76 Bh**)
2. What is a trigger in DBMS? [1] (**74 Bh**) [3] (76 Ba, 71 Ma)
3. Explain the working of triggers along with its syntax and an example. [5] (**80 Ch**)
4. Is it safe or risky to use triggers? Explain. [3] (76 Ba)
   |→When is it risky to use triggers? [3] (71 Ma)

4.3 Functional Dependencies

1. Define Functional Dependence. [1] (73 Ma) [2] (**81 Bh**) [3] (**73 Bh**, 75 Ba, 71 Ma)
   |→Define functional dependency? Explain. [4] (**70 Bh**)
2. What is Decomposition? [1] (81 Ba)
   |→Define decomposition and its desirable properties. [3] (73 Ma)
3. Define an extraneous attribute in a Functional dependency. [2] (**79 Ch**)
4. What is a partial dependency? [1] (**80 Ch**)
5. Define a partial and transitive functional dependency with example. [3] (**79 Ch**) [4] (73 Ma)
6. What do you mean by closure of functional dependency? [3] (**77 Ch**, 76 Ba)

4.4 Multi-valued and Joined Dependencies

1. What is lossless decomposition and dependency preservation? [3] (**72 Ash**)
2. What is a lossless-join decomposition? [4] (**70 Bh**)
3. Explain the conditions to be satisfied for lossless decomposition using FD sets. [3] (**76 Bh**)
4. Define Multi Valued Dependency (MVD). [2] (**76 Bh**)
5. Differentiate primary key and foreign key. [2] (**75 Bh**)
6. Explain trivial and non-trivial dependencies. Explain BCNF. [2] (**74 Bh**)
7. Explain the necessary condition for decomposing a relational database table into two tables. [4] (70 Ma)
8. Let a relation be R (A, B, C, D, E, F) and set of Functional Dependencies (F) = (AB→C, BC→AD, D→EF). Find the Candidate Keys. [4+4] (**81 Bh**)

9. Computing a canonical covering of the given FD. R = (A, B, C) and F = (A→BC, B→C, A→B, AB→C). [4] (81 Ba)
10. The set of functional dependencies is: (A→BC, CD→E, B→D, E→A), decomposed it into R1 = (A, B, C), R2 = (A, D, E). Show that this decomposition is a lossless-join decomposition. [4] (**80 Bh**)
11. Given a relation R = A, B, C, D and corresponding FDs: F = A→BC, B→D, A→B, AB→C. Find attribute closure $\{A\}^+$, $\{BC\}^+$. Which of these attribute deserve the property of candidate key? Justify. [2+2] (**79 Ch**)
12. Suppose that we decompose the schema R = (A, B, C, D, E) into (A, B, C) and (C, D, E). Is it lossless decomposition? Does it preserve dependencies? Consider the following set F of functional dependencies hold A→BC; CD→E; B→D; E→A. [2+2] (**78 Ch**)
13. Consider the relation Treatment with the schema: Treatment (doctorID, doctorName, PatientID, diagnosis) and functionaorID, patientID)→diagnosis.
    Describe diffel dependencies: [5] (**75 Bh**)
    doctorID→doctorName and (doctorID, patientID)→diagnosis.
    Describe different types of problem that can arise for this relation with records.
14. Suppose that we decompose the scheme R = (A, B, C) into R1 = (A, B), R2 = (A, C). Show that this decomposition is a lossless join decomposition and not dependency preserving if the F = {A→B, B→C} [4] (72 Ma)
15. Suppose that we decompose the schema R = (A, B, C, D, E) into (A, B, C) and (C, D, E). Is it lossless decomposition? Is it dependency preserving? [4] (**72 Ash**)
    Consider that the following set F of functional dependencies hold.
    A→BC, CD→E, B→D, E→A

4.5 Different Normal Forms(1st, 2nd, 3rd, BCNF, DKNF)

1. What is normalization? [1] (**79 Bh**,**78 Ch**) [2] (**73 Bh**, 80 Ba)
2. Why normalization is an important in DBMS? [1] (**80 Bh**,**78 Ch**, 76 Ba) [2] (**79 Bh**,**72 Ash**)
   |→What is the purpose of Normalization? [2] (**77 Ch**)
   |→Why do we need normalization? [2] (**75 Bh**) [4] (70 Ma)
3. Explain anomalies in DBMS with example. [3] (**80 Bh**)
4. Explain the role of functional dependecny in normalization of data. [2] (**74 Bh**, 80 Ba)
5. What is view in database system? [2] (**76 Bh**)
6. How does materialized view differ from normal view? [1] (**76 Bh**) [2] (**72 Ash**)
7. Define 1NF, 2NF and 3NF. [3] (76 Ba)
   |→Explain 1NF, 2NF, 3NF and 4NF. [4] (**73 Bh**)
8. Define 2NF and 3NF with examples. [2+2] (**80 Ch**)
9. Explain Fourth normal form with an example. [3] (**76 Bh**)
10. How do you normalize a database from unnormalized form to 1NF, 2NF, 3NF and 4NF? [6] (**71 Bh**)
11. How can you convert an unnormalized table to 3NF? Explain with example. [5] (**79 Bh**)
12. Briefly explain about 3NF and BCNF with example. [3] (81 Ba) [4] (**77 Ch**, 73 Ma)
13. Explain BCNF. [3] (**74 Bh**,**73 Bh**)
14. How do you achieve a relation in a BCNF? Describe the algorithm. [3] (**79 Ch**)
15. Explain BCNF in terms of functional dependencies. [3] (71 Ma)
16. Differentiate between 3NF and BCNF with suitable examples. [3] [4] (70 Ma)(**75 Bh**) [6] (**78 Ch**)
    |→Compare the advantage of BCNF over 3NF. [2] (76 Ba)
    |→What is the advantage of 3NF over BCNF? [3] (72 Ma) [4] (**70 Bh**)

5 Query Processing and Optimization

(4 Hours/8 Marks)

1. Define query processing. [1] (**78 Ch**)
2. Explain about the steps involved in query processing.
   [2] (**80 Bh**) [3] (**78 Ch**) [4] (**76 Bh**) [5] (**77 Ch**)
   |→with necessary diagram. [4] (**81 Bh**,**80 Ch**, 80 Ba) [5] (**79 Ch**, 76 Ba)
   |→with examples. [4] (**79 Bh**)
3. Briefly outline the Query Porcessing and optimization. [3] (81 Ba)

5.1 Pipelining

1. What is pipelining in query evaluation. Explain with an example. [3] (76 Ba)
2. Briefly explain about the pipelining approaches used for evaluation of query. [4] (**81 Bh**)
3. How is pipeline approach different from materialization approach? [4] (**78 Ch**)
4. Explain how pipelining can be used to improve query evaluation of efficiency. [3] (**77 Ch**)

5.2 Query Cost Estimation

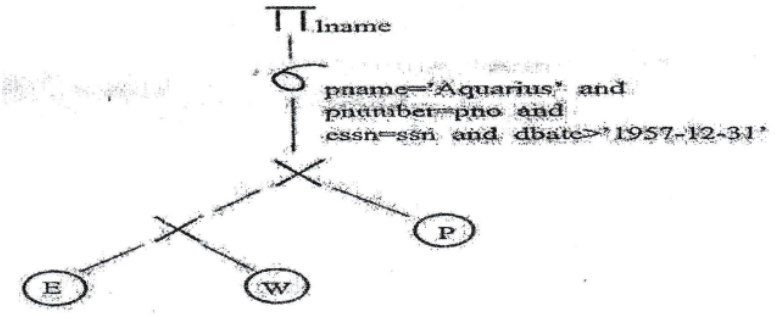
5.3 Query Operations

5.4 Evaluation of Expressions

1. What is pipelining evaluation in a query? Explain with an example. [3] (**79 Ch**)
2. Discuss the methods used for evaluation of entire expression tree. [3] (**76 Bh**)
3. (Assumed) Transform the following relational algebra expression using equivalence rule. Show each step involved. [6] (**80 Bh**)
   instructor (ID, name, dept_name, salary)
   teaches (ID, course_id, sec_id, semester, year)
   course (course_id, title, dept_name, credits)
   $\Pi_{\text{name, title}}$ ($\sigma_{\text{dept\_name}}$ = "Music"^year = 2017
   (instructor) $\bowtie$ (teaches $\bowtie$ $\Pi_{\text{course\_id, title}}$(course))))

5.5 Query Optimization

1. What are the different approaches for Query Optimization? Explain in brief. [4] (**80 Ch**)
2. Explain the differences between cost-based and heruistics based methods of query optimization.
   [4] (**79 Bh**) [5] (80 Ba)
3. Optimize the given tree. [5] (81 Ba)



5.6 Query Decomposition

5.7 Performance Tuning

6 File Structure and Hashing

(4 Hours/8 Marks)

6.1 Records Organizations

6.2 Disks and Storage

6.3 Remote Backup System

6.4 Hashing Concepts, Static and Dynamic Hashing

6.5 Order Indices

6.6 B+ tree index

7 Transactions processing andConcurrency Control

(6 Hours/12 Marks)

7.1 ACID properties

7.2 Concurrent Executions

7.3 Serializability Concept

7.4 Lock based Protocols

7.5 Deadlock handling and Prevention

8 Crash Recovery

(4 Hours/6 Marks)

8.1 Failure Classification

8.2 Recovery and Atomicity

8.3 Log-based Recovery

8.4 Shadow paging

8.5 Advanced Recovery Techniques

9 Advanced database Concepts

(4 Hours/6 Marks)

9.1 Concept of Objet-Oriented and Distributed Database Model

9.2 Properties of Parallel and Distributed Databases

9.3 Concept of Data warehouse Database

9.4 Concept of Spatial Database