POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2017
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Describe about Schemas and Instances Write briefly about DDL and DML. 7

   b) Draw an ER diagram for the following scenario. 8
   A university contains many faculties. The faculties in turn are divided into several colleges. Each college offers numerous programs and each program contains many courses. Teachers can teach many different courses and even the same course numerous times. Courses can also be taught by many teachers. A student is enrolled in only one program but a program can contain many students. Students can be enrolled in many courses at the same time and the courses have many students enrolled.

2. a) Consider the following schema: 8
   employee (person_name, street, city)
   works (person_name, company_name, salary)
   company (company_name, city)
   manages (person_name, manager_name)
   Give an expression in relational algebra to express each of the following queries:
   a) Find the names of all employees who earn more than their managers
   b) Find the names of all employees who live in the same city and on the same street as their managers
   c) Find the names of all employees within the database that do not work for "NBL company"
   d) Find the names of all employees in the database who earn

more than the top earner at "NBL Company" in the database.

b) Write the SQL statements for the following queries by reference of **Liquors_Info** relation: 7

Serial No	Liquors	Start year	Bottles	Ready year
1	Gorkha	1997	10	1998
2	Divine Wine	1998	5	2000
3	Old Durbar	1997	12	2001
4	Khukuri Rum	1991	10	1992
5	Xing	1994	5	1995

i. Create the Liquors_Info relation.
ii. Insert the records in Liquors_Info as above.
iii. List all the records which were ready by 2000.
iv. Remove all records from data base that required more than 2 years to get ready.

3. a) How does "GROUP BY" claus work? What is the difference between WHERE and HAVING clause? Explain each with examples 8

b) What is a database anomaly? Explain different types of database anomalies with suitable examples. 7

4. a) What do you mean by normalization process? Why is it necessary in RDMBS? Justify. 7

b) Differentiate between authorization and authentication with brief examples. 8

5. a) Why ACL technique if considered safe- way for database security? How is any user allowed or prevented from accessing a certain resource? Justify technically. 7

b) What is Query optimization? How can it be achieved? 8

6. a) Explain how records of a file are placed and organized into a secondary storage. 8

b) What is Remote backup system? How does it help any organization? Clarify. 7

7. Write short notes on: **(Any two)** 2x5

a) ACID Properties of transaction
b) Concurency control
c) Distributed Databases

POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2017
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Define database management system (DBMS). Mention the advantages of DBMS. Explain data independence with its importance. 7
   b) What do you mean by data model? What are the basic data modelling components? Briefly explain different types of data models. 8
2. a) Define relation schema and views. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course: 8
   STUDENT(SSN, Name, Major, Bdate)
   COURSE(Course#, Cname, Dept)
   ENROLL(SSN, Course#, Quarter, Grade)
   BOOK_ADOPTION(Course#, Quarter, Book_ISBN)
   TEXT(Book_ISBN, Book_Title, Publisher, Author)
   Draw a relational schema diagram specifying the foreign keys for this schema.
   b) Explain several parts of Structured Query Language (SQL). What are the basic domain types? Describe them. 7
3. a) Describe the basic structure of SQL queries. Considering at least two relations, write SQL for illustrating different types of set operations. 7
   b) Design relational database for the Dept. of Computer Engineering (DoCE) at Pokhara University. Your database should have at least three (3) relations. Describe referential integrity constraint based on the above database of DoCE. 8
4. a) Define normalization in database. Mention its significances. With example, explain requirements to satisfy 1NF, 2NF, and 3NF. 8
   b) Briefly explain encryption techniques to secure application data. 7

5. a) With diagram, briefly explain the basic steps of query processing. 7
   b) Define indexing in database. With example, describe the structure of a B^+-tree. 8

6. a) Explain the architecture of remote backup system. Discuss several issues that must be addressed while designing it. 8
   b) Define transaction and explain its ACID properties. Describe the two-phase locking protocol for concurrency control. 7

7. Write short notes on: **(Any two)** 2×5
   a) Data Dictionary
   b) QBE
   c) Functional Dependencies

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2018
Programme: BE Full Marks: 100
Course: Database Management System Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Explain the difference between physical and logical data independence. List the major steps that you would take in setting up a database for a particular enterprise. 7

   b) Suppose you are given the following requirements for a simple database for the Employee Management System: 8

   i. An employee may work in up to two departments or may not be assigned to any department.
   ii. Each department must have one and may have up to three phone numbers.
   iii. Each department can have anywhere between 1 and 30 employees.
   iv. Each phone is used by one, and only one, department.
   v. Each phone is assigned to at least one, and may be assigned to up to 30 employees.
   vi. Each employee is assigned at least one, but no more than 5 phones.

   Construct a clean and concise ER diagram for the database. Clearly indicate the cardinality mappings.

2. a) Consider the following relational Schema: 7
   Department (**DepartmentID**,DepartmentName)
   Designation (**DesignationID**, DesignationName.Salary)
   Employee(**EmpID**, mpName, Gender,
   DesignationID,DepartmentID)
   Allowance (**AllowanceID**,AllowanceName)
   Allowance Details (DetailID, EmpID, AllowanceID, Amount)

Write the relational algebraic expression for the following task:

i. Find the number of employees department-wise.
ii. List the employee details whose total salary is above Rs. 50000.
iii. List the employee those who are getting house allowance.

b) Consider the following three relations. 8

Doctor(Name, age , address)
Works(Name, Depart_no, salary)
Department(Depart no, depname, floor, room)

Write down the SQL statement for the following.

i. Display the name of doctor who do not work in any department.
ii. Modify the database so that Dr. Hari lives in Pokhara.
iii. Delete all record of Doctor working in OPD department.
iv. Display the name of Doctors who work in at least two departments.

3. a) Differentiate between SQL and MYSQL. Why access to database from a general purpose programming language is required? Explain. 7

b) Define 1NF, 2NF and 3NF. What is the motivation behind normalizing the database? 8

4. a) What are the roles of Assertions and Triggers in SQL? Consider following bank database: 7

Branch-schema = (branch-name, branch-city, assets)
Loan-schema = (loan-number, branch-name, amount)

Write an assertion for the bank database to ensure that the Assets value for the Koteshwor branch is equal to the sum of all the amounts lent by the Koteshwor branch.

b) Why security is needed in database? How security can be granted using view explain. 8

5. a) Construct a B+-tree for the following set of key values: 7
(1, 3, 6, 7, 11, 17, 19, 23, 30, 32). Assume that the tree is initially empty and values are added in ascending order.
Construct B+-trees for the case where the number of pointers that will fit in one node is Four. Also show the form of the tree after

POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2018
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Considering an example, differentiate between data and information. Explain, how DBMS overcome the limitations of traditional file processing system. 7

   b) Construct an *ER diagram* for a Metropolitan Bus Park. There are many gates for entering bus park. Different gates are assigned to different routes. A route uses different buses. Bus consists of different seats which are assigned to different passengers. Frequent travelers are also in passenger. Associate a log of reservation date while reserving seats. The passenger name must have two attributes first_name & last_name. Each of the entities must have primary key attribute as far as possible. The cardinality mappings should be explained properly. 8

2. a) Consider the relational database model: 7

   Users (uid, cname, city)
   Items (itemid, itemname, city, quantity, price)
   Manager (mid, aname, city)
   Query (queryno, uid, mid, itemid, query_details, hitratio)

   Write the relational algebraic expression for the following tasks:

   i. Find all (queryno, uid) pairs for query with a hitratio value greater than 500.
   ii. Find all item names of items in Pokhara ordered with query_deatis as pokhara_details.
   iii. Find itemids of items ordered through manager 35 but not through manager 27.

   b) Write SQL statements for following: 8

   i. Create a table named Vehicle with veh_number as primary key and following attributes:
   veh_type, veh_brand, veh_year, veh_mileage, veh_owner,

veh_photo, veh_price

ii. Enter a full detailed information of a vehicle.

iii. Increment vehicle's price by 10,000.

iv. Remove all vehicle's records whose brand contains character 'o' in second position.

v. Display the total price of all vehicles.

vi. Create a view from above table.

vii. Display details of vehicles ordering on descending manner in brand and by mileage when brand matches.

viii. Change data type of year to datetime.

3. a) How does normalization help in organizing records in database? Justify with examples. 8

   b) Write down the properties of decomposition. Compare & contrast assertion & triggers. 7

4. a) Differentiate between authorization and authentication. Explain about access control and view. 7

   b) What is query optimization? List some strategies for optimization of queries and explain steps in for query processing with necessary diagram. 8

5. a) What is file organization? Explain how you organize files using B+ tree and hash index. 8

   b) What do you mean by crash recovery? Differentiate between deferred database modification and immediate database modification. 7

6. a) Define transaction & schedule. Explain different states in a transaction. 7

   b) Explain about distributed databases with its advantages and disadvantages. 8

7. Write short notes on: **(Any two)** 2×5

   a) Sequential File Organization

   b) Cascading in referential integrity

   c) Data warehouse & Data mining

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2019
Programme: BE Full Marks: 100
Course: Database Management System Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) What do you understand by Data Independence? How is Schema different from Instance? Justify with some suitable examples. 7
   b) How does UML diagram assist during data modeling? Draw an E-R diagram for a Gandaki Auto Vehicle Shop System including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram 8
2. a) How Relational Algebra is different from Relational Calculus? Define TRC and DRC. 7
   b) Consider a simple relational database of Hospital Management System. (*Underlined attributes represent Primary key attributes*) 8

   Doctors (DoctorID, DoctorName, Department, Address, Salary)
   Patients (PatientID, Patent Name, Address, Age, Gender)
   Hospitals (PatientID, Doctor ID, HostpitalName, Location)

   Write down the SQL statement for the following:

   i. Display ID of Patient admitted to hospital at Pokhara and whose name ends with's'.
   ii. Delete the record of Doctors whose salary is greater than average salary of doctors.
   iii. Increase the salary of doctors by 18.5% who works in OPD department.
   iv. Find the average salary of Doctors for each address who have average salary more than 55K.
3. a) Define Normalization. Explain about 1NF, 2NF & 3NF. 7
   b) What do you mean by decomposition of relational schema? Suppose we are given Schema R = {A,B,C,G,H,I} and set of functional 8

dependencies F={A→ B,A→ C, CG→ H, B→H, CG→I}. Find the closures of functional dependency F.

4. a) What is Access control mechanism in database? Explain different types of access control mechanism. 8

   b) Diagrammatically illustrate and discuss the steps involved in processing a query. 7

5. a) Construct a B+ tree for the following set of key values: (2,3,5,7,11,17,19,23,29,31) Assume that the tree is initially empty and values are added in ascending order where the pointer number is Four 8

   b) What is Crash Recovery? What are the problems due to crash? How the problems can be avoided, explain any one briefly. 7

6. a) When does deadlock occurs? Explain two-phase commit protocol with example. 7

   b) What are data fragmentations? State the various fragmentations with examples. 8

7. Write short notes on: **(Any two)** 2×5

   a) ACID property

   b) QBE

   c) Object Relational Model

POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2019
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Explain the concept of DBMS and its applications tracing the evolution. 7
   b) Construct an ER diagram for keeping records for Library Management Systems. 8

2. a) Using the following schema represent the following queries using Relational algebra : 8
   PROJECT (Project num, ProjectName, ProjectType, ProjectManager)
   EMPLOYEE (Empnum, Empname)
   ASSIGNED_TO (Projectnum, Empnum)
   i) Find Employee details working on a project name starts with 'L'
   ii) List all the employee details who are working under project manager "Rohan"
   iii) List the employees who are still not assigned with any project.
   iv) List the employees who are working in more than one project.

   b) Write the SQL statements for the following queries by reference of **Hotel_details** relation: 7

hotel_id	hotel_name	estb_year	hotel_star	hotel_worth
1	Hyatt	2047	Five	15M
2	Hotel Ktm	2043	Three	5M
3	Fulbari	2058	Five	20M
4	Yak and Yeti	2052	Four	11M
5	Hotel Chitwan	2055	Three	7M

   i. Create a database named hotel & table relation.
   ii. Create a view named Price which shows hotel name & its worth.
   iii. Modify the data so that Hotel Chitwan is now four star level.
   iv. Delete the records of all hotels having worth more than 9M.

3. a) What are store procedures? Explain equi Join, natural join, left and right outer join with examples. 8

   b) Differentiate between Functional Dependency and Multi Valued Dependency? Explain closure set of functional dependencies with example. 7

4. a) Define third normal form. Convert the following 2NF relation into 3NF(consider **Name** as primary key) 8

Name	Address	Phone	Salary	Post
Gill	KTM	456789	20000	Engineer
Van	BKT	654321	20000	Engineer
Robert	KTM	456789	20000	Engineer
Brown	BKT	654321	10000	Overseer
Albert	KTM	454545	10000	Officer

   b) What is security and integrity violations? Explain the need of access control, Authorization and Authentication. 7

5. a) What is query cost estimation? Explain cost based & heuristic based choice of evaluation plan for query optimization. 7

   b) Create a B+ tree of order 4 with following data: 8
   (4, 9, 16, 25, 1, 20, 13, 15, 10, 11, 12) of order 4. Assume that, tree is initially empty and values are added in ascending order.
   Also, show the formation of tree after the deletion of 16.

6. a) What is concurrency control? Describe ACID property of transaction. 8

   b) Define recovery. When the two transactions are said to be in deadlock state? How these deadlocks can be addressed. 7

7. Write short notes on: (**Any two**) 2×5
   a) Architecture of Distributed Database
   b) Role of Database administrator
   c) Dense and Sparse Index

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2020
Programme: BE Full Marks: 100
Course: Database Management System Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Why data independence is important in data modeling? Differentiate between physical and logical data independence. 7
   b) Define and explain benefits of data model. Draw an E-R diagram for a Vehicle Management System including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram. 8
2. a) Explain Relational Algebra. What are the relational algebra operations that can be performed? Give an example of all. 7
   b) Write SQL statements for following: 8
      i. Create a table named Automotor with chasis_number as primary key and following attributes: veh_brand, veh_name, veh_model, veh_year, veh_cost, veh_color, veh_weight
      ii. Enter a full detailed information of an automotor.
      iii. Change any Automotor's year to 2019.
      iv. Remove all Automotor records whose model contains character 'i' in last position.
      v. Display the total cost of all vehicles of the table Automotor.
      vi. Create a view from above table having vehicles only red color.
      vii. Display details of Automotor ordering on descending manner by brand name and by ascending on model when brand matches.
      viii. Change data type of color so that it only takes one character.
3. a) Differentiate between join and sub query. Explain different SQL joins with examples. 8

b) What is functional dependency? Discuss its types. Explain the role of Functional dependency in the process of normalization. 7

4. a) What is multi-valued dependency? Illustrate the advantage of 4NF with suitable example. 8

b) Describe the GRANT functions and explain how it relates to security. What types of privileges may be granted? How rights could be revoked? 7

5. a) Define query optimization. What are the basic steps of query processing? Explain. 7

b) In terms of file organization, define *Indexing, Elevator Algorithm, Log disk.* How does a mechanical hard disk work? 8

6. a) What is a transaction? What is a serializable schedule? Describe the dead lock handling mechanism. 7

b) Explain different types of crash recovery algorithm with suitable examples. 8

7. Write short notes on any two: 2×5

a) Two phase locking

b) Data Godown v/s Data Warehouse

c) Schema and instances

POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2021
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Data Independency. Differentiate between Schema and Instance with the help of an example. 7
   b) Differentiate between Data model and E-R model. Draw an E-R diagram for a Library Management System including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram. 8
2. a) Consider following relations, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries: 8

   Doctor(SSN, FirstName, LastName, Specialty, YearsOfExperience, PhoneNum) Patient(SSN, FirstName, LastName, Address, DOB, PrimaryDoctor_SSN) Medicine(TradeName, UnitPrice, GenericFlag) Prescription(Id, Date, Doctor_SSN, Patient_SSN) Prescription_Medicine(Prescription Id, TradeName, NumOfUnits)

   i. List the trade name of generic medicine with unit price less than $50.
   ii. List the first and last name of patients whose primary doctor named 'John Smith'
   iii. List the first and last name of doctors who are not primary doctors to any patient.
   iv. List the SNN of distinct patients who have 'Aspirin' prescribed to them by doctor named 'John Smith'.

   b) Write SQL statements for following: 7
   i. Create a table named Chef with chef_license as primary key and following attributes:
   chef_license, c_fname, c_lname, c_dob, c_gender, c_experience_hours, c_photograph
   ii. Enter a full detailed information of a chef.
   iii. Change chef's experience hours by any value.

iv. Remove all chef records whose name contains character 'r' in second position in his first name.
v. Display the total experience hours of all chef.
vi. Create a view from above table.
vii. Display details of chef ordering on descending manner in last name and by first name when last name matches.

3. a) Explain Data Constraints and its types with examples. 8
   b) What is the role of Triggers? Write an SQL trigger to carry out the following action: On **delete** of an account, for each owner of the account, check if the owner has any remaining amount, and if she does not, delete her from the *depositor* relation. 7
4. a) Explain about database normalization and its importance. Explain 1NF, 2NF and 3NF with examples. 8
   b) What is security violation and integrity violations? Explain the need of access control, Authorization and Authentication. 7
5. a) Define query optimization. What are the basic steps of query processing with the help of a diagram 8
   b) How do you evaluate the performance of a magnetic disk? What are the optimization techniques to reduce the disk block access? 7
6. a) What is a transaction? Write about the 'ACID' property of any transaction. 7
   b) What is Crash Recovery? Explain log based recovery and what happens for a log-based recovery. 8

   <T0 Start >
   <T0, A, 1000,950 >
   <T0, B, 2000, 2050 >
   <T0 commit >
   <T1 Start >
   <T1, C, 700, 600 >

7. Write short notes on: (**Any two**) 2×5
   a) RAID
   b) Stored procedure
   c) Distributed Database

POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2021
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is data independency? Why is it required in DBMS? Explain in detail. 7

   b) What is ER diagram? Draw an ER diagram for a library system. Assume the entities- student, teacher, book and semester. In the diagram illustrate the concept of strong entity, week entity, composite attributes, multivalued attributes, and derived attributes. 8

2. a) Define schema and views. Considering the following schemas: 8

   Sailors (sid, sname, rating, age)

   Boats (bid, bname, color)

   Reserves (sid, bid, day)

   Write relational algebra expressions for the following queries:

   i. Find the records of sailors who have reserved boat number 103 (bid=103).
   ii. Update the color of the boat, where bid is 104, into green.
   iii. Find the names of sailors who have reserved a red or green boat.
   iv. Find the names of sailors who have reserved boat number 103 on day 5.
   v. Find the names of sailors whose name is not 'Ram'
   vi. Find the names of all boats.

   b) What are DDL and DML queries in SQL? Consider the relations in 2(a) and write the SQL statements for the queries in 2(a). 7

3. a) What are the different types of integrity Constraints? Explain with examples. 8

b) What is database normalization? Discuss normalization process with a suitable example until it satisfies 3 NF. 7

4. a) What are the needs of security? Explain about the access control, authorization and authentication. 7

b) Consider the relation schema in 2(a). Write the relational algebra expression for the query "Find the names of sailors who have reserved a red or green boat". Construct the initial operator tree and final efficient operator tree after applying transformation rules. 8

5. a) Explain file organization using hash indices with example. 7

b) What is Crash Recovery? Explain log based recovery method with example. 8

6. a) Explain the serial schedule and serializable schedule with examples. 8

b) What are object- oriented database model? Explain the advantage and disadvantage of object-oriented database over relational database. 7

7. Write short notes on: **(Any two)** 2×5

a) Data dictionary

b) ACID properties

c) Query By Example (QBE)

POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2022
Programme: BE | Full Marks: 100
Course: Database Management Systems | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Define DBMS. What are the advantages of DBMS over traditional file system? 7
   b) Why do you need E-R diagram? Draw an E-R diagram for online shop management system. Assume relevant entities and attributes for the given system. 8
2. a) Suppose we have the following relation: 8
   Employee(person_name, street, city)
   Works (person_name, company_name, salary)
   Company (company_name, city)
   Write relational algebra expressions for the following queries:
   i. Find names of all employees who live in 'Butwal' and whose salary is less than Rs. 50,000.
   ii. Find the names of all employees who work for "Nabil Bank Limited".
   iii. Find the names and cities of residence of all employees who work for "Global bank"
   iv. Update the salary of all employees by 10%.
   b) Define stored procedure. What is the advantage of the stored procedure? Explain how stored procedures are created in SQL. 7
3. a) Consider the relation **Actress_Details** and write the SQL statements for the following queries: 8

Players_id	Actress_name	Debut_year	Recent_release	Actress_fee
1	Renu	2010	Samay	400000
2	Sita	2022	Radha	300000
3	Geeta	2001	Mato	600000
4	Amita	1990	Man	700000
5	Karishma	1989	Prem	100000

i. Create the table Actress_details relation.
ii. Delete the data of actress whose recent release is Prem.
iii. Modify the database so that Renu's new release is "Win the Race" film
iv. Insert a new record in the above table.

b) Consider the following relation where {M_ID and P_ID} are primary keys. State in which normal form the relation is. What anomalies can occur in this relation? How can these anomalies be removed? 7

M_ID	M_Date	P_ID	Quantity
M11	16 June, 2022	I1	20
M11	26 June, 2022	I6	30
M22	3 September, 2022	I5	20
M22	13 September, 2022	I6	60
M22	23 September, 2022	I2	35

4. a) When do you use triggers? Explain with any one example of triggers in SQL. 7

b) Differentiate between authentication and authorization. How encryption and decryption occurs in private key and public key cryptography? 8

5. a) Consider the relation schema in 2(a), Write the relational algebra expression for the query "Find the names of all employees who lives in Pokhara". Construct the initial operator tree and final efficient operator tree after applying transformation rules. 8

b) What is file organization? Explain how you organize files using hash index. 7

6. a) What is crash recovery? Discuss shadow paging with necessary diagram. 7

b) What do you understand by concurrency control? Explain two phase locking protocol with examples. 8

7. Write short notes on: (**Any two**) 2×5

a) Remote backup system
b) ACID properties
c) Distributed database

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Database Management System (Old)

Semester: Fall

Year : 2023
Full Marks:100
Pass Marks: 45
Time :3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Why do you need DBMS? Explain in detail. 7
   b) Draw an ER diagram of a college database that keeps the information about student, teachers, course, department and semester. (Assume suitable relationships and attributes by yourself). 8
2. a) Consider the following relations: 8

   STUDENT(Student_ID, Student_Name, Major)
   COURSE(Course_ID, Course_Name, Credits)
   ENROLL(Student_ID,Course_ID,Grade)

   Write the relational algebra expression for:

   i. Find the names of all students who are enrolled in a course with a course name that starts with "MATH".
   ii. Update the credits of courses to 4 where the credits are currently less than 3.
   iii. Find the average grade for each major.
   iv. Update the name of the "COMPUTER_SCIENCE" major to "COMPUTER_ENGINEERING".

   b) What are triggers? Explain with suitable examples. 7
3. a) Consider the following relations: 8

   Employee(emp_id, name, address, telephone, salary, age)
   Works_on (emp_id, project_id, join_date)
   Project(project_id, project_name, city, duration, budget)

   Write the SQL commands for the following:

   i. Find the name of projects whose name starts with m and ends with a.
   ii. Find the project name with maximum budget.
   iii. Delete information of employees whose age is greater than average age of all employees.

iv. Increase salary of employee who lives in Butwal by 25%.

b) What are the problems in the given relation? Normalize this relation up to 3 NF to remove those problems. 7

SID	Name	SubID	SubName	FeePaid
1	Hari Dangol	ENG	English	20000
2	Mohan Shah	ENG	English	20000
3	Indira Rimal	ENG	English	30000
1	Hari Dangol	CPROG	C programming	20000
2	Mohan Shah	CPROG	C programming	15000
3	Indira Rimal	MATH	Mathematics	30000

4. a) What is a stored procedure? Explain with an example. 7

b) Consider the relational schema: 8

Employee(person_name,street,city)

Works(person_name,company_name,salary)

Company(company_name,city)

Write the relational algebra expression for the query "Find the names of all employees whose company is located in Pokhara". Construct an initial operator tree and final efficient operator tree after applying transformation rules.

5. a) Differentiate between authentication and authorization in brief. 7

b) What is file organization? Explain how you organize files using hash index. 8

6. a) Explain the log-based recovery in detail with suitable example. 7

b) What is serializable schedule? Explain conflict serializability and testing of conflict serializability with suitable examples. 8

7. Write short notes on: **(Any two)** 2×5

a) ACID properties

b) Distributed database

c) Referential Integrity

POKHARA UNIVERSITY

Level: Bachelor | Semester : Spring | Year : 2023
Programme: BE | Full Marks: 100
Course: Database Management System | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Differentiate between database schema and instances. Briefly describe DDL, DML and DCL. 8

   b) Define relational data model. Draw an E-R diagram for a Library Management System including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram. 7

2. a) Suppose we have the following relation. 8

   Employee(person_name, street, city)

   Works (person_name, company_name, salary)

   Company (company_name, city)

   Write relational algebraic expressions for the following queries:

   i. List the name and city of employee who work in "pokhara" and have salary greater than Rs. 50,000.
   ii. Find the names of all employees who work for "ABC bank".
   iii. Delete all employee who come from "Chitwan".
   iv. Increase salary of all employee by 15%.

   b) What are different kinds of joins? Explain in brief. 7

3. a) Write SQL statements for the following queries using the given Employees relation: 8

E_id	Fname	Lname	Department	Salary	Hire_Date
01	Ramu	Bashyal	Sales	20000	2023-08-08
02	Damu	Pandey	IT	50000	2022-01-01
03	Biru	B.K.	Sales	40000	2021-02-10
04	Hiru	Dhamala	HR	35000	2023-12-18
05	Biren	Khadka	IT	60000	2012-10-22

i. Create a database named Company and Employees relation.
ii. Create a view that shows the E_id, Department and Hire_Date of all employees.
iii. Modify the table such that the Department of Biren is HR now.
iv. Delete the record of employees whose Lname is "Pandey".

b) What is referential integrity? Explain about a trigger with an example. 7

4. a) What is database normalization? Explain in detail about INF, 2NF, 3NF with suitable examples. 8

b) What are authorization and authentication? Why are they important? Explain in detail. 7

5. a) What are the steps in query processing? Make an operator tree for the following SQL expression: 7

```
Select customer_name
FROM branch, account, depositor
WHERE branch_city='btl' AND balance>2000;
```

b) What are the benefits of using B Tree index over the sequential and indexed sequential file organization? Explain. 8

6. a) Explain Log based recovery system with an appropriate log record example. 7

b) Why should the transactions' schedule be serialized? Explain conflict and view serializability with example. 8

7. Write short notes on: **(Any two)** 2×5

a) Data Dictionary
b) Stored procedure
c) Object oriented Database