

POKHARA UNIVERSITY

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

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)~~ What is data abstraction in DBMS? Explain in detail. 7
b) Consider you are asked to design a database for the Exam section of your college. Draw its ER diagram assuming required entities and their attributes. 8
2. ~~a)~~ Convert the ER diagram that you designed in question no 1 b) into relational schema. 7
b) What are the views? Consider the table **tbl_emp** as follows: 8

| Emp_id | Emp_name | Salary | Department | Date_of_joining |
|--------|----------|--------|------------|-----------------|
| 101 | Anish | 20000 | Packing | 2070-02-01 |
| 102 | Rojina | 18000 | Cleaning | 2075-04-06 |
| 103 | Sita | 35000 | Polishing | 2078-09-12 |

Write the SQL statements for the following:

- ~~i.~~ Create the above table by considering Emp_id as primary key and insert the above records.
- ~~ii.~~ Change the Department of Anish to marketing.
- ~~iii.~~ Increase the salary of employees whose department is Cleaning by 12%.
- ~~iv.~~ Find the name of employees having salary greater than 16000 and who joined after 2072-11-25
- ~~v.~~ Add a new column Address to the above table.
- ~~vi.~~ Delete the entire table.

OR

Why is joining in SQL necessary? Explain Inner Join, Natural Join and Outer Join with suitable examples.

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

- b) What is denormalization? Why is it necessary? Explain in detail. 7
4. a) What is the role of views in security? Explain the concept of authorization with suitable examples. 7
- b) Explain the basic steps in query processing in detail. 8
5. ~~b)~~ Explain how the records are organized using fixed-length and variable-length records. 7
- b) What is serializability and why is it needed? Explain the ACID properties in brief. 8
6. a) What is crash recovery? Explain log-based recovery method with example. 7

OR

What is transaction rollback? Explain how the Remote Backup System provides high availability and recovery facility.

b) List out the different categories of NoSQL databases. Explain the concept of blockchain with its properties. 8

7. Write short notes on: (Any two)

a) Nested Queries

b) Third Normal Form (3NF)

c) Lock-based protocols for concurrency control

2×5

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Attempt all the questions.

1. a) What is a database management system? Difference between Physical and Logical Data Independence. 7
- b) Draw E-R diagram for airline reservation system. The system must keep track of customers and their reservations, flights and their status, seat assignments on individual flights. Include appropriate relationship and cardinality. 8

OR

Draw an ER diagram of an "Exam System of Pokhara University" using extended features. Explain Primary key and Foreign key.

2. a) Consider the following schema: 7
 STUDENT(Student_ID, Student_name, Major)
 COURSE(Course_ID, Course_name, Credits)
 ENROLLS_IN(Student_ID, Course_ID, Grade)
 Write the relational algebra expressions for the following cases:
 - i. Find the names of all students who are enrolled in courses with names that start with "C".
 - ii. Update the grades of students to 'A' whose current grade is 'B'.
 - iii. Find the average credits of courses each student is enrolled in.
 - iv. Update the name of the course "Physics" to "Advanced Physics".

- b) Let us consider the following relation: 8
 Sailors (sid, sname, rating, age)
 Boats (bid, bname, color)
 Reserves (sid, bid, day)
 Write a SQL statements for the following:
 - i. Find the records of sailors who have reserved boat number 75 (bid=75).

- ii. Update the color of the yellow boat to green.
 - iii. Delete the records of sailors whose rating is less than 5.
 - iv. Find the name and rating of sailors who have reserved a black or blue boat.
 - v. Find the age of sailors who have reserved boat number 25 on day 3.
3. a) Define integrity constraints? Explain different integrity constraints with suitable examples. 8

OR

Why is database normalized? Explain about 1NF, 2NF, 3NF & BCNF.

- b) Explain different types of functional dependencies with examples. Find the closure of attributes A, AC and ABC for the relation $R(A,B,C,D)$ where $A \rightarrow B, BC \rightarrow D$ are the dependencies in R. 7
4. a) Compare authentication and authorization. Explain the different types of access control mechanisms. 7
- b) How query optimization is carried out? Explain about cost estimation of query. 8
5. a) Construct a B+ tree of order 4 for the given key values assuming empty tree initially and keys arranged in ascending order: $\{4,8,1,20,5,15,16,7,9,38,34,6,39,25\}$ 7
- b) What is serializability? Explain how concurrency control protocols are used? 8
6. a) What are NoSQL databases? Explain the advantages of NoSQL databases. 7
- b) Differentiate between centralized and distributed databases. Explain in brief about NOSQL. 8
7. Write short notes on: (Any two) 2×5
- a) Equivalence of expressions
 - b) Stored Procedures
 - c) ACID Property