

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Semester Fall

Level: Bachelor

Year: 2023

Program: BE sw/comp

Time: 3 hrs.

Course: Database management system

FM: 100

PM: 45

✓ *Candidates are requested to give their answers as far as practicable in their own words.*

✓ *The figure in the margin indicates the full marks*
Attempt all the question

1. a. ✓ Why there is multilayer architecture present in DBMS? Describe the 3 level schema architectures in detail. 7

Or

Explain the importance of DBMS. How do DBMs help in the field of IT? Also explain how DBMS is accessed using various DDL, DML, and DCL languages.

- b. Draw an ER diagram of an Online Ticket reservation System using extended features. Also, convert it into the schema diagram. 8

2. a. Write Relational algebra for the following schema 9

Book (ISBN, Title, Price, Category, pages)

Written_by (ISBN, Aid, Year)

Author (Aid, Name)

- Find the title and category of the book which was published in 1994, written by "Simanta" and has pages between 400 to 800.
- Find the number of books published in 1990 that are written by "Simanta".
- Insert new book entry with ISBN=123456, Title=ABCD, Price, and category are same as DBMS book and pages are same as OS book
- Increase the price of the book by 15% which has pages >3000 and decrease by 15% which has pages <2500.
- Find the Title, Price, and category of a book whose author information is not provided.
- Find the maximum and minimum price of the book according to their category.

6

- b. ✓ What are the keys in the database why it is needed? Explain all keys present in the database for a given functional dependency and identify the Primary key and candidate key, Prime attributes, and non-prime attributes.

Z->W, Y->XZ, XW->Y

3. a. Write SQL for the following 9
- Student (Sid, Sname, Sgender, Saddress)**
Result(Gid,Sid)
Grade(Gid, Marks, Grade, stream)
- Create the above schema and insert any 2 records in each schema.
 - Increase the marks of female students by 10% *who is from pokhara and score marks between 20-30.* *who is from 'pokhara'*
 - Find the 2nd highest marks of a student.
 - Find the average marks of a student whose name starts with 's' and ends with 'a'.
 - Find the highest marks streamwise and sort them with marks.
 - What are the rules for performing Union and intersection

- b. The table shows a portion of a shipment table for a large manufacturing company. Each shipment (identified by shipment#) uniquely identifies the shipment origin, Destination, and distance. The shipment origin and Destination pair also uniquely identify the distance. 6
- Show the functional dependencies in the shipment relation.
 - In what normal form is SHIPMENT? Why?
 - Is there insertion, deletion, and updation anomaly? if yes then explain.
 - Convert it into 3NF if necessary, and show the resulting table(s) with the sample data presented in SHIPMENT.

Shipment	Origin	Destination	Distance
409	Seattle	Denver	1537
618	Chicago	Dallas	1058
723	Boston	Atlanta	1214
824	Denver	Los angles	975
629	Seattle	Denver	1537

4. a. Explain the basic steps in query processing with a diagram in RDBMS. What is evaluation expression in query evaluation? Explain its types with an example. 8

Or

What is a Cost estimation, Query optimization, and query tree? Draw the query tree for 2a(i) and (ii).

- b. What is the access control and access control list? Differences between Discretionary Access Control (DAC) and Mandatory Access Control (MAC). 7

5. a. What is a crash? Explain different kinds of failures that occur in transactions. Explain Log-based recovery and its types with proper examples. 7

Or

What is a checkpoint? Explain shadow paging and also mention how it is better than log-based recovery. Also, mention its disadvantages. 8

- b. What is file organization? What are the 2 methods of it? Draw a B+ tree for the following keys with order 4.

1,4,7,10,17,21,31,25,19,20,28,42

Also, delete 21,31,20,10,7,25,42,4

T1	T2	T3
		R(A)
	R(A)	
		W(A)
R(A)		
W(A)		

- a. What is serializability? For the given schedule check whether it is a conflict serializable or not if yes then show the final conflict equivalent schedule. 8

Or

What are the problems that occurred due to concurrency? Explain the Two-phase and strict

two-phase locking protocol in detail.

- ✓ b. What are object-oriented database models? Explain the advantages and disadvantages of object-oriented databases over relational databases. 7

7. Write short notes on (Any Two):

2×5

- a. Inference rules b. Remote Backup system
c. Cryptocurrency d. Integrity constraints