

LIB
25/11/13 FN

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 75484

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Third Semester

Software Engineering

ESE 033 — DATABASE MANAGEMENT SYSTEMS

(Regulation 2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A database is defined as “a shared collection of logically related persistent data as part of the information system of an organization”. Define the meaning of “shared”, “logically related” and “persistent data”.
2. What are the causes of data redundancy? How does the DBMS minimize the data redundancy?
3. When is RAID technology used for DBMS?
4. Why is a B+ tree a better structure than a B tree for implementation of an indexed sequential file?
5. What is the difference between DELETE TABLE and TRUNCATE TABLE commands in SQL?
6. Why is a relation with many NULLs considered to be bad? Justify your answer.
7. How does the domain relational calculus differ from tuple relational calculus?
8. How do statistics and catalogs of database help to optimize the query execution plan in query processing?
9. What do you mean by Database Granularity? Does granularity have any relation with Database security? Justify your answer.
10. What are differences between the log based recovery system and check point based recovery system?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the significant reasons of using database system over the traditional file system.
- (ii) Explain the three schema architecture view of database system design with its corresponding components. (8 + 8)

Or

- (b) Explain the need of conceptual database design. Consider the following activities to be done in an cookware manufacturing company. The cookware manufactures products like pressure cookers, cookware, water purifier, food processors etc. The company markets its products to wholesalers all over India and dealers sell them to any of the customers. The company has four regional offices and many sales persons are attached to regional offices. Salespersons contact dealers and explain about products, incentives offered, and training programs for wholesalers and demo for customers. Dealers place orders with the salespersons attached with the regional office of their close location. Company would like to develop a system to monitor sales of different products, performance of salespersons and orders from wholesalers.

Design the conceptual database/ ER diagram by identifying the entities, attributes, relationships, cardinalities and connectivity. Convert this ER diagram design into its equivalent relational model tables by explaining the logic involved. (16)

12. (a) (i) Explain the advantages and disadvantages of various methods of disk block allocation for the database files.
- (ii) Discuss the multilevel indexes and multiple key indexes with example. (8 + 8)

Or

- (b) Explain which of the three basic file organizations would you choose for a file where the most frequent operations are as follows? What is the most appropriate auxiliary/secondary storage structure (Indexing / Hashing) for the chosen file organization?

Heap/Sorted/flash : Search for records based on a range of field values.

Heap/Sorted/Hash : Perform inserts and scans where the order of records does not matter.

Heap/Sorted/Hash : Search for a record based on a particular field value. (16)

13. (a) (i) Explain the selection, projection and join relational algebraic operations with its corresponding SQL statements.
- (ii) Explain the significant uses of views and its classifications. Consider the relation Absence (student, date), with the primary key (student, date). Which records the dates when students are absent from University distance classes. To illustrate this, a small extension is given in Figure 1:

Table Absence :

Student	Abdate
Sriram	12/01/2013
Kalyan	03/02/2013
Sriram	05/03/2013
Senthil	05/03/2013

Figure 1

View : AbsCount

```
CREATIVE VIEW AbsCount AS SELECT student,
COUNT (abdate) As noAbsences FROM
Absence GROUP BY student ;
```

Figure 2

Consider the view AbsCount as defined in Figure 2. This represents the number of absences per student. Finally, consider the following update operation attempted on AbsCount :

UPDATE AbsCount SET noAbsences = 4 WHERE student = 'Sriram' ;

Discuss how this update operation could be dealt by a relational DBMS and draw a general rule regarding updating view. (8 + 8)

Or

- (b) Explain the purpose and steps of normalization process by considering the following database design which models the car rental system.

Car Reg No	Make	Model	Cust ID	CustName	Hire date	Trip No.	Place	Driver ID	Driver Name
TN37AF7752	Ford	Escort	C100	Suman, P.	14/5/09	21	Ooty	D01	Ram
TN35AZ1752	Ford	Escort	C222	Jeyanthi, V.	15/5/09	22	Kodai	D02	Kalyan
TN30F2256	Nissan	Sunny	C100	Smith, J.	14/7/08	22	Kodai	D03	Mohan
TN37AF7752	Ford	Escort	C303	Balu, F.	14/2/09	23	Nilgiris	D01	Ram
TN37AF7752	Ford	Escort	C100	Mathi, S.	16/3/10	22	Kodai	D01	Ram
TN30F2256	Nissan	Sunny	C222	Vijay, V.	15/3/10	24	Yercaud	D03	Mohan

- (i) The data in the table is subjected to modification anomalies. Provide examples of how insertion deletion, and update anomalies could occur on this table.
- (ii) Identify the functional dependencies represented by the data in the table. State any assumptions you make about the data.
- (iii) Using the functional dependencies identified describe and illustrate the process of normalization by converting this table into 3 normal form relations.
- (iv) Identify the primary and foreign keys in your relations. (16)
14. (a) Explain the need of semantic query optimization. With the help of a block diagram describe the phases of Query processing. How do we optimize a query under consideration? Assume a relation R (A, B, C, D) is given; R is stored as an unordered file and contains 1000000 (1 million) tuples. Attributes A, B, C, D need 4 byte of storage each, and blocks have a size of 4096 Byte. Moreover we assume that static hashing is used to implement index structures and that index Pointers require 4 byte of storage; furthermore you can assume that pages of index blocks are 80% full and do not contain any overflow pages. What index structures would you create to speed up the following 3 queries?

Q1 : Select A, C
from R
where B = 12 ;
returns 200 answers

Q2 : Select D
from R
where C = 12 ;
returns 30000 answers

Q3 : Select sum (R.D)
from R
where C = 12 ;
returns one answer

Describe which index structures you would create. Justify your design, how they would be stored, and compute the cost for executing queries Q1, Q2, and Q3 for your chosen design. (16)

Or

- (b) (i) Explain the ACID properties of database transaction with examples.
- (ii) Discuss the various types of serializability with examples. (8 + 8)
15. (a) Explain the various types of locking used in concurrent database transactions. Also, consider a banking system, where A and B are two accounts accessed by two transactions T1 and T2. T1 transfers Rs. 5000/- from account B to account A. Transaction T2 displays the total amount of money in accounts A and B. In order to control the interaction among the concurrent execution of T1 and T2 lock requests have been added to T1 and T2 as follows :

T1 :	write lock(B)	T2 :	read lock(A)
	read(B)		read(A)
	B := B - 5000		unlock(A)
	write(B)		read lock(B)
	unlock(B)		read(B)
	write lock(A)		unlock(B)
	read(A)		display(A+B)
	A : A + 5000		
	write(A)		
	unlock(A)		

Suppose that the values of accounts A and B are Rs. 10000/- and Rs. 20000/-, respectively. If these transactions are executed serially, either in the order T1, T2 or in the order T2, T1, transaction T2 will display the value. If these transactions are executed concurrently, are the locking operations enough to ensure that transaction T2 always displays the correct value Rs. 30000/- ? Justify your answer, If locking operations are not correct, modify T1 and T2 to ensure serializability. (16)

Or

- (b) What are the issues related to database security and privacy? Explain the facilities provided by the database system for various kind of data access control, privacy and security protection. Perhaps the most important data items in any database system are the passwords that control access to the database. Suggest a scheme for the secure storage of passwords. Be sure that your scheme allows the system to test passwords supplied by users who are attempting to log into the system. (16)
-