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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
 [AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
 Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60027

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026

Fourth Semester

Information Technology

U23IT407 - DATABASE SYSTEMS

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analysing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q. No.	Questions	Marks	KL	CO
1.	Define an entity and an attribute in a database context, providing an example to illustrate their relationship.	2	K1	CO1
2.	List the different types of cardinality mappings in database systems.	2	K1	CO1
3.	Differentiate between procedures and functions in a database, focusing on their characteristics and usage.	2	K2	CO2
4.	List the commands under Transaction Control Language (TCL) and Data Manipulation Language (DML).	2	K2	CO2
5.	Mention the ACID properties of a database and state their significance in maintaining transaction reliability.	2	K1	CO3
6.	Discuss the importance of concurrency control in database systems.	2	K2	CO3
7.	State the principles behind RAID.	2	K2	CO4
8.	Compare and contrast primary indexes and secondary indexes, highlighting their differences in data retrieval.	2	K2	CO4
9.	Specify the types of distributed data storage systems.	2	K2	CO5
10.	Outline the advantages of using MongoDB over traditional relational databases.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q. No.	Questions	Marks	KL	CO
11. a)	Identify and explain the various operators used in relational algebra, highlighting their functions and how they are applied in database queries.	13	K2	CO1
	(OR)			
b)	Discuss the various components that can be represented using ER modelling. Explain in significance with suitable examples.	13	K2	CO1
12. a)	Consider the following database Student (id, name, age, grade) Enrolment (enrollid, studentid, course, marks)	13	K3	CO2
	i. List all students along with their enrolled subject and marks.			
	ii. Find average marks in math.			
	iii. Get the names of all students who solved more than 85 in any subject.			
	iv. Count the number of courses student has registered for.			
	v. Find the students who have not enrolled in any course.			
	(OR)			
b)	Illustrate the significance of Boyce-Codd Normal Form (BCNF) and its relationship with Third Normal Form (3NF), highlighting the key differences and why BCNF is considered a stronger form of normalization.	13	K3	CO2
13. a)	Examine how transaction schedules operate in database processing and discuss the role of serializability in these schedules. Highlight why serializability is essential for preserving consistency in a database.	13	K2	CO3
	(OR)			
b)	Highlight the importance of recovery concepts in database management systems. Discuss how techniques like log-based recovery, check pointing, and shadow paging work to ensure database reliability.	13	K2	CO3
14. a)	Describe how records are organized in files and explain the methods used to store records, such as fixed-length records, variable-length records, and record pointers. Apply these methods to a real-world scenario, explaining which method would be most suitable based on the specific requirements .	13	K2	CO4

(OR)

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|--------|---|----|----|-----|
| b) | Compare and contrast static hashing and dynamic hashing with respect to their handling of collisions, bucket overflow, and the efficiency of data retrieval. | 13 | K2 | CO4 |
| 15. a) | Discuss the architecture of a distributed database system, its components and how they interact to provide data storage, transaction processing, and query execution across multiple nodes. | 13 | K2 | CO5 |

(OR)

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|----|--|----|----|-----|
| b) | Illustrate in detail about the MongoDB implementation of distributed databases and how MongoDB handles sharding, replication, and transaction management in its distributed environment. | 13 | K3 | CO5 |
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PART – C

(1 x 15 = 15Marks)

- | Q. No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | Explain in detail about the use of RAID (Redundant Array of Independent Disks) impact the performance, reliability, and scalability of database storage in both transactional and analytical systems. Also explain the role of different RAID levels (0, 1, 5, 6, 10) in a database environment and provide examples of situations where each RAID level would be most beneficial. Additionally, discuss how RAID can be combined with other techniques like caching and sharding for improved database performance. | 15 | K2 | CO4 |

(OR)

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|----|--|----|----|-----|
| b) | Illustrate how does query processing differ in distributed databases compared to centralized databases. Interpret the roles of query decomposition, data localization, join processing, and distributed query optimization. Outline the challenges in query execution, and how are data skew and network latency handled in large-scale distributed systems. | 15 | K3 | CO5 |
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