B.Tech Even Semester Examination, May, 2025

Computer Science & Engineering
(4th Semester)

Course No: CSE-403
(Database Management Systems)

Full Marks: 50
Pass Marks: 15
Time: 2 hours

Note:
1. Attempt any five questions
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

1. (a) With a neat diagram, explain three-tier architecture in DBMS. 5

   (b) Explain

   i) Logical data independence

   (ii) Physical data independence 2.5+2.5=5

2. (a) What is an unsafe query? Give an example and explain why it is important to disallow such queries. 2+3=5

   (b) What is relation? Differentiate between a relation schema and a relation instance. Why foreign key constraints are important in a relational model? 1+2+2=5

3. (a) Consider the following three tables: SAILORS, RESERVES and BOATS having the following attributes:

SAILORS (Salid, Salname, Rating, Age)

RESERVES (Salid, Boatid, Day)

BOATS (Boatid, Boatname, Color)

Use the above schema and solve the following queries in relational algebra.

i. Find the name of sailors who have reserved boat 103.

ii. Find the names of sailors who have reserved a red boat.

iii. Find the colours of boats reserved by Smith.

iv. Fi Times New Romannd the name of sailors who have reserved a red or a green boat. 1.5×4=6

(b) Draw an E-R diagram for an operator who can work many machines and each machine has operators. Each machine belongs to one department but a department can have many machines. Assume your own entities (minimum 3 entities), attributes and relations. Explain in detail. 4

4. (a) Consider the relation R (A, B, C, G, H, I) and set of FDs are A→B, A C, CG H, CG I, and B H. Compute (AG⁺). 5

(b) Consider the following relation schemas and set of Fds:R is (A, B, C, D, E) with FDs:

{**A BC, BC E, E DA**}

(i) Identify candidate keys of R.

(ii) Is R is 2NF.

(iii) Is R is 3NF or BCNF. 1+2+2=5

5. (a) What is the need for normalization in database design? Consider the relation schema R (A, B, C) which has the FD B C. If A is a candidate key for R, is it possible for R to be in BCNF? If so, under what condition? If not, expalin why not. 1+4=5

(b) What is meant by dependency preservation and lossless join property of a decomposition? Write a procedure to compute a closure of a set of FDs (F⁺). 1+1+3=5

6. (a) List out the desirable properties of the transaction. Explain each of them. 1+3=4

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(b) Define the terms blind read, unrepeatable read, and serializable schedule. 2+2+2=6

7. (a) Explain the dynamic 2-phase locking protocol with the help of an example. What do you mean by starvation in the concurrency control mechanism? 3+2=5

(b) What are the differences between the wait-die and wound-wait schemes in deadlock prevention schemes using timestamps? 5

8. (a) What is the search key for an index? What is data entry in an index? Can an index itself store data records (i.e., act as a file)? 1+1+2=4

(b) How many clustered indexes can you create on a file? Would you always create at least one clustered index for a file? 1+2=3

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