

Faculty of Engineering & Technology
Fifth Semester B.E. (Computer Science Engg.)
(C.B.S.) Examination

DATABASE MANAGEMENT SYSTEM

Time—Three Hours]

[Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
 - (2) Solve **SIX** questions as follows :
 - Que. No. 1 **OR** Que. No. 2
 - Que. No. 3 **OR** Que. No. 4
 - Que. No. 5 **OR** Que. No. 6
 - Que. No. 7 **OR** Que. No. 8
 - Que. No. 9 **OR** Que. No. 10
 - Que. No. 11 **OR** Que. No. 12
 - (3) Illustrate the answers with necessary figures/
drawings wherever necessary.
1. (A) Explain different approaches used to build
database. 6

(B) Consider below schema and answer the following in SQL :

Teacher (Tid, Thame, cid, city, sal)

Teach (Tid, sid, classname)

Subject (Sid, sname, duration, Totlect)

College (Cid, cname, city, Totemp)

- (i) Find the names of teachers who live in Pune or Nagpur and salary is greater than 10,000. 1
- (ii) Find all teachers who live in same city as that of their college. 1
- (iii) Find the name and id of all teachers who work for 'SP' college. 1
- (iv) Find all teachers who earn more than average salary of all employees of their college. 2
- (v) Find all teachers who teaches a subject 'Maths'. 2
- (vi) Find the subject name whose name ends with char 's' and requires 50 total lectures. 1

OR

- 2. (A) Draw ER diagram for banking system. 5
- (B) Explain different roles played by DBA. 5
- (C) Enlist different database users. 4

3. (A) All candidate keys can be super key but not all super keys can be a candidate key. All primary keys can be a candidate key but not all candidate keys can be a primary key.

Justify above statements with proper explanation. 5

- (B) Let $R = (A, B, C)$ and let r_1 and r_2 both be relations on schema R . Give an expression in the domain relational calculus that is equivalent to each of the following :

(a) $\pi_A (r_1)$

(b) $\sigma_{B=17} (r_1)$

(c) $r_1 \cup r_2$

(d) $r_1 \cap r_2$

(e) $r_1 - r_2$. 5

- (C) What is Referential Integrity ? Explain in brief. 3

OR

4. (A) Let the following relational schema be given as $R(A, B, C)$ and $S(D, E, F)$. Give an expression in SQL that is equivalent to following query :

(a) $\pi_C (\sigma_{B=20} (R))$

(b) $R \times S$

(c) $\pi_B (R)$

(d) $\pi_{B,E} (\sigma_{C=D} (R \bowtie S))$

(e) $\sigma_{E > 20} (S)$

(f) $\pi_{C,F} (R \bowtie S)$

6

(B) What is Relational algebra ? Explain its importance with various operations involved in it. 7

5. (A) Construct B^+ tree for following set of values (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that tree is initially empty and values are added in ascending order. Construct B^+ trees for cases where number of pointers that will fit in one node is as follows :

(a) Four

(b) Six

(c) Eight.

6

(B) Write a note on Bitmap indexing.

3

(C) Define Indexing. Explain various index evaluation metrics.

5

OR

6. (A) Consider the relation schema $R(A, B, C)$ with functional dependencies :

$$AB \rightarrow C \text{ and } C \rightarrow A$$

Show that schema R is in 3NF but not in BCNF, also determine minimal key for R . 5

- (B) Define Normalization. Explain 1NF, 2NF and 3NF. 6

- (C) Compute $(ABE)^+$ and $(AB)^+$ for relation $R = \{A, B, C, D, E\}$ with following functional dependencies :

$$A \rightarrow BC$$

$$CD \rightarrow E$$

$$B \rightarrow D$$

$$E \rightarrow A. \quad 3$$

7. (A) Define materialization. Explain it with the help of example. 5

- (B) Explain Heuristic optimization in detail. 5

- (C) Write in brief about Pipelining. 3

OR

8. (A) What is query processing ? Explain basic steps involved in query processing. 6

(B) Let Relations $R_1(A, B, C)$ and $R_2(C, D, E)$ have following properties : R_1 has 20,000 tuples and R_2 has 45,000 tuples where

25 tuples of R_1 on one block and

30 tuples of R_2 on one block.

Estimate number of block access required using each of the following join strategies of $R_1 \bowtie R_2$:

(a) Block nested loop join

(b) Nested loop join

(c) Merge join

(d) Hash join.

7

9. (A) Explain two phase commit protocol in detail.

6

(B) What is deadlock ? Explain different deadlock prevention techniques.

7

OR

10. (A) Explain different concurrency related problems.

6

(B) Define Transaction. Explain ACID properties of Transaction.

5

(C) Write a short note on log-based protocol.

2

11. (A) What is Buffering ? Explain role of operating system in Buffer management. 6

(B) Explain different security schemes used to protect data in database. 7

OR

12. Write a note on following (any **THREE**) :

(a) Shadow paging

(b) Distributed database

(c) Data warehousing

(d) Web database

(e) Aries recovery algorithm. 13