

- Note (1) Q1. is compulsory, attempt any four out of remaining.  
(2) All question carry equal marks.  
(3) Answer to sub-questions should be grouped together.

- Q1. (a) Draw an ER diagram for railway ticket booking system. Document all assumptions that you make for designing. 10  
(b) Write schema definition and normalize all tables in 3NF for the above ER diagram. 10
- Q2. (a) Write a detailed note on query optimization. 10  
(b) Explain architecture of database system. What are roles and responsibilities of a DBA? 10
- Q3. (a) What are different levels of data independence? Explain in detail. 10  
(b) What is deadlock? Describe and compare deadlock detection and prevention techniques. 10
- Q4. Differentiate between the following 20  
a) Hierarchical and network model  
b) Strong and weak entity  
c) structure and hash indexing  
d) Ternary and aggregation
- Q5. (a) What is bell la pedula model? Explain in detail. 10  
(b) Define decomposition. Explain loss less and dependency preserving decomposition. 10
- Q6. (a) What is an index on a file? What is search key for an index? Why do we need indices? 10  
(b) What is transaction? Explain ACID properties. 10
- Q7. Write short note on **any four** of the following 20  
(a) triggers  
(b) crash recovery and checkpoints  
(c) shadow paging  
(d) types of database  
(e) super and candidate keys
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