Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **17CS3004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED DATABASE SYSTEMS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | How is the cost of a plan estimated? What is the role of the system catalog? What is the selectivity of the access path and how does it influence the cost of a plan? Discuss in detail with appropriate examples. | CO1 | 10 |
| b. | Discuss some of the influencial design choices made in System R optimizer. | CO1 | 5 |
| c. | What is metadata? What metadata is stored in the system catalog? Describe the information stored per relation and per index. | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | When are two relational algebra expressions considered equivalent? How is equivalence used in query optimization? What algebra equivalences that justify the common optimizations of pushing selections ahead of joins and re-ordering of join expressions? | CO2 | 10 |
| b. | List the main approaches to evaluate joins. Why are joins expensive? Justify with suitable cost calculation. | CO2 | 10 |
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| 3. | a. | State and justify the Thomas Write Rule. |  | 5 |
|  | b. | Consider a database organized in terms of the following hierarchy of objects: The database itself is an object (D), It contains two files (F1 and F2), each of which contains 1000 pages (P1…P1000 and P1001…P2000, respectively) Each page contains 100 records and records are identified as *p : i*, where pis the page identifier and I is the slot of the record on that page.  Multiple granularity locking is used with S,X,IS,IX and SIX locks at database-level, file-level, page-level and record- level locking. For each of the following operations, indicate the sequence of lock requests that must be generated by a transaction that carry out these operations   1. Read record P1300:8 2. Read all (records on all) pages in file F1 3. Delete record P1100:97 | CO3 | 10 |
|  | c. | In optimistic concurrency control, no locks are set. Transactions read and modify data objects in a private workspace. How are conflicts between transactions detected and resolved in this approach? | CO3 | 5 |
| (OR) | | | | |
| 4. | a. | Describe the three steps in crash recovery in ARIES? Illustrate the goal and process of each phase with examples. | CO2 | 15 |
|  | b. | What are the different types of log records and when are they written? | CO2 | 5 |
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| 5. | a. | What are the choices in tuning the conceptual schema? Explain it in detail with suitable examples. | CO2 | 10 |
|  | b. | What is the impact of locking on database performance? How can we reduce lock contention and hot spots? | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Describe six high-level guidelines for index selection. | CO5 | 10 |
|  | b. | Why automatic index tuning a hard problem? Give an example algorithm for automatic index tuning. | CO5 | 10 |
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| 7. | a. | Discuss how each of the following operators can be parallelized using data Partition: scanning, sorting, join. Compare the use of sorting versus hashing for partitioning | CO4 | 10 |
|  | b. | Explain the three main architectures for distributed DBMSs. | CO4 | 10 |
|  |  |  |  |  |
| (OR) | | | | |
| 8. | a. | What is the difference between synchronous and asynchronous replication? Describe in detail about the voting and read-any-write-all approaches to synchronous replication. | CO4 | 10 |
|  | b. | Elucidate the deadlock detection in a distributed database. Compare and contrast the centralized, hierarchical and timed-out approached. | CO4 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | What are objects, subjects, security classes and clearances in mandatory access control? Discuss the Bell-Lapadula restrictions in terms of these concepts. Specifically, define the simple security and the \* - property. | CO2 | 10 |
|  | b. | What is an R tree? What is the structure of data entries in R trees? How can we minimize the overlap between bounding boxes when splitting the nodes? How does concurrency control in an R tree work? | CO6 | 10 |

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