

Final Exam, Trimester: Spring 2022

Course Code: CSE-3521 Course Title: Database Management Systems

Total Marks: 40 Duration: 2 hours

**Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.**

| 1. | 1. Consider a relation with schema R(A,B,C,D) with following functional dependencies (FD’s):   BC → A, AD → B, CD → B, AC → D.  Find all the candidate keys of R.   1. Consider a relation R (A, B, C, D) with the following instance  | **A** | **B** | **C** | **D** | | --- | --- | --- | --- | | 1 | 1 | 2 | 3 | | 1 | 2 | 2 | 3 | | 1 | 3 | 2 | 3 | | 2 | 4 | 5 | 6 | | 5 | 6 | 7 | 8 |   Which of the following functional dependencies are satisfied by this relation? How?  (i) A → B  (ii) A → CD  (iii) BD → AC  (iv) AD → BC   1. What is decomposition? Briefly explain lossless decomposition with an example. 2. Consider a relation with schema R(A,B,C,D) with following functional dependencies (FD’s):   AB → C, B → D, C → A  Can we decompose the relation into BCNF form by preserving dependency? If not, then what will be the maximum normalized form that can be achieved by preserving dependency. | 2+2+3+5 |
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| 2. | a) “A secondary index is always a dense index” – explain this statement with examples.  [Answer any one of the following 2(b) questions]  b) Consider an extensible hashing scheme where the bucket capacity is 2 and the initial local and global depth are both 1. Insert the following five records in the hash table **showing the state of the table for each record insertion**. Assume that the LSB (least-significant bit) is being checked to find the directory for a record.   | **Record** | **Key** | ***hash(Key)*** | ***hash(Key)* in binary** | | --- | --- | --- | --- | | Record-1 | 1620 | 20 | 10100 | | Record-2 | 1821 | 29 | 11101 | | Record-3 | 1075 | 18 | 10010 | | Record-4 | 2115 | 11 | 01011 | | Record-5 | 5659 | 27 | 11011 |   or, b) Write short notes on the following five topics in context of indexing.  Sector, Track, Search Key, Record, Multilevel indexing | 3+5 |
| 3. | 1. If the order of a B+ tree is 6, then determine the minimum number of keys and minimum number of pointers for root node and internal nodes. 2. Construct a B+ tree for the following set of key values, where each internal node can contain at most 5 children. Assume that the tree is initially empty and values are added sequentially one by one.   7, 10, 1, 23, 5, 15, 17, 9, 11, 39, 35, 8, 40, 25 | 3+7 |
| 4. | 1. How can we ensure atomicity and durability of transactions? Write down what you understand by view serializability.   [See rest of the Q4 on the next page]   1. Find out whether the following schedule is conflict serializable or not. If it is conflict serializable, show the serial schedule.  | **T1** | **T2** | **T3** | **T4** | | --- | --- | --- | --- | | read(A) |  |  |  | | read(B) |  |  |  | |  | read(B) |  |  | | write(A) |  |  |  | |  |  |  | read(C) | |  |  | read(A) |  | |  |  | write(A) |  | |  | write(B) |  |  | |  | Write(C) |  |  | |  |  |  | write(C) | |  |  | write(B) |  | | read(C) |  |  |  | | 3+7 |