

BCSE302L Database System
Slow Learner Assignment-I

1. Develop a multilevel indexing structure with four keys in each level of the index tree for the key values 2, 35, 55 and 85. Explain the single and multi-level indexing techniques. You must create at least three levels of the tree by considering the first level bases as 2, 8, 15, 24, 35, 39, 44, 51, 55, 63, 71, 80 and 85. The primary key fields are 2, 5, 8, 12, 15, 21, 24, 29, 35, 36, 39, 41, 44, 46, 51, 52, 55, 58, 63, 66, 71, 78, 80, 82, 85 and 89.
2. A database table contains the following key field value: 1, 2, 4, 7, 8, 12, 16, 20, 21, 24, 27, 32, 34, 37, 42, 46, 47, 51, 53, 55, 58, 60, 69, 70, 71, 72, 78, 80, 82, 85 and 89. Create an index file using B+ tree. Perform insertion and deletion after creation of index file.
3. Consider the Employee table and create an index file using designation column with the following search key value: CEO, Assistant, Manager, Director, Engineer, Peon, Clerk and Accountant. Assume that the tree is initially empty, that the three pointers fit in one node. Construct the B+ tree using the above mentioned key values. After that
 - (i) Insert the key value: secretary, Join secretary and Assistant Director.
 - (ii) Delete the AssistantDemonstrate the all steps that you have used for index creation and updation.
4. Construct a hash index for the following set of key values {1, 2, 4, 7, 8, 12, 16, 20, 21, 24, 27, 32, 34, 37, 42, 46, 47, 51, 53, 55, 58, 60, 69, 70, 71, 72, 78, 80, 82, 85 and 89}. Explain how you will handled the Bucket overflow.
5. Is $B \rightarrow G$ in F^+ where $R = \{A, B, C, D, E\}$ and $F = \{B \rightarrow CD, E \rightarrow F, D \rightarrow E, B \rightarrow A, AD \rightarrow B, F \rightarrow G\}$.
Remove any redundant FDs from the following sets of FDs given in F, using the attribute closure algorithm where $F = \{AD \rightarrow B, B \rightarrow C, C \rightarrow D, A \rightarrow B\}$.
6. Derive the proof for the following Inference Rules.
 - (i) $X \rightarrow YZ$, then $X \rightarrow Y$ and $X \rightarrow Z$
 - (ii) $X \rightarrow Y$ and $X \rightarrow Z$, then $X \rightarrow YZ$
 - (iii) $X \rightarrow Y$ and $WY \rightarrow Z$, then $WX \rightarrow Z$
7. Determine all the keys, Prime and Non-Prime Attributes for the relation T(PQRS) with the following Functional Dependencies. $F = \{PQ \rightarrow R, R \rightarrow S, S \rightarrow Q\}$
8. Identify the Normal Form for the relations R and S given below Relation R(ABCD) with set of Functional Dependencies $F = \{AB \rightarrow C, B \rightarrow C, A \rightarrow D\}$. Relation S(PQR) with set of Functional Dependencies $F = \{PQ \rightarrow R, R \rightarrow Q\}$
Decompose the relations R and S such that they attain Boyce Codd Normal Form.
9. A relation R(ABCDE) with the set of Functional Dependencies $F = \{A \rightarrow C, B \rightarrow C, C \rightarrow D, DE \rightarrow C, CE \rightarrow A\}$ is decomposed as shown below R1(AD), R2 (AB), R3(BE), R4(CDE), and R5 (AE). Apply the test for non-additive Join Property and determine if the decomposition of R into $\{R1, \dots, R5\}$ is a lossless join decomposition.

10. Given a relation scheme $R(ABCDEFGH)$ with a set of FDs $F = \{ AB \rightarrow CD, AD \rightarrow G, E \rightarrow D, BC \rightarrow AH, AG \rightarrow EH \}$.
- (i) Find the minimal cover from the above functional dependency.
 - (ii) Consider the given functional dependency and check whether the relation is in BCNF or not. If not then decompose in BCNF.