

# Birla Institute of Technology & Science, Pilani

Work Integrated Learning Programmes Division  
M. S (Software Engineering) at Wipro Technologies (WASE)  
II Semester 2014 - 2015  
Comprehensive Examination (Regular)

**Course Number:** SEWP ZG512  
**Course Title:** DATABASE MANAGEMENT SYSTEMS  
**Type of Exam:** Open Book  
**Weightage:** 60%  
**Duration:** 3 Hours  
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<b>No. of Pages: 3</b> <b>No. of Questions: 8</b>
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Session – FN

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Q1. Please read the information given below before attempting the questions that follow.

EmpMaster (eid: number, ename: varchar, sal: number, age: number, deptid: number)

Dept(deptid: number, budgetAmt: number, floor: number, mgrid: number)

Salaries range from Rs.10,000 to Rs.100,000, ages vary from 20 to 80, each department has about five employees on average, there are 10 floors, and budgets vary from RS.10,000 to Rs 100,000. You can assume uniform distribution of values. Explain your answers briefly.

Query1: Print ename, age, and sal for all employees.

Query2: Find the deptids of departments that are on the 10th floor and have a budget of less than Rs25,000

- 1.1 For each of the following queries, which index would you choose to speed up the query? [2.5]  
1.2 If your database system does not consider index-only plans (i.e., data records are always retrieved even if enough information is available in the index entry), how would your answer change? [2.5]

Q2. Consider the following relations: [1x5=5]

Student (snum: integer, sname: string, major: string, level: string, age: integer)

Class (name: string, meets at: string, room: string, fid: integer)

Enrolled (snum: integer, cname: string)

Faculty (fid: integer, fname: string, deptid: integer)

The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.

Write the following queries in SQL. No duplicates should be printed in any of the answers.

- 2.1 Find the age of the oldest student who is either a History major or enrolled in a course taught by 'I. Teach'.  
2.1 Find the names of all classes that either meet in room R128 or have five or more students enrolled.  
2.1 Find the names of all students who are enrolled in two classes that meet at the same time.  
2.1 Find the names of students enrolled in the maximum number of classes.  
2.1 For each age value that appears in Students, find the level value that appears most often. For example, if there are more FR level students aged 18 than SR, JR, or SO students aged 18, you should print the pair (18, FR).

- Q3. Construct a B+-tree for the following set of key values: [2+2+1=5]  
 (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)  
 Assume that the tree is initially empty and values are added in ascending order.  
 Construct B+-trees for the cases where the number of pointers that will fit  
 in one node is as follows:  
 a. Four  
 b. Six  
 c. Eight

- Q4 Determine whether the following decomposition of SP(S#,Sname,Scity,Status,P#,Pname,Price,qty) is a loss less join decomposition? Write the matrix and show the steps. [5]

**Decomposition:**

CS(Scity,Status)  
 SUPP(S#,Sname,Scity)  
 Part(P3,Pname,Price)  
 SPN(S#,P#,Qty)

**FDs Holding on SP:**

S#-->Sname,Scity  
 Scity→Status  
 P#-->Pname,Price  
 {S#,P#}→Qty

- Q5. Suppose you are given a relation R with four attributes ABCD. For each of the following sets of FDs, assuming those are the only dependencies that hold for R. [10]
- (a) Identify the candidate key(s) for R.  
 (b) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).  
 (c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

Perform the above tasks for the following set of functional Dependencies:

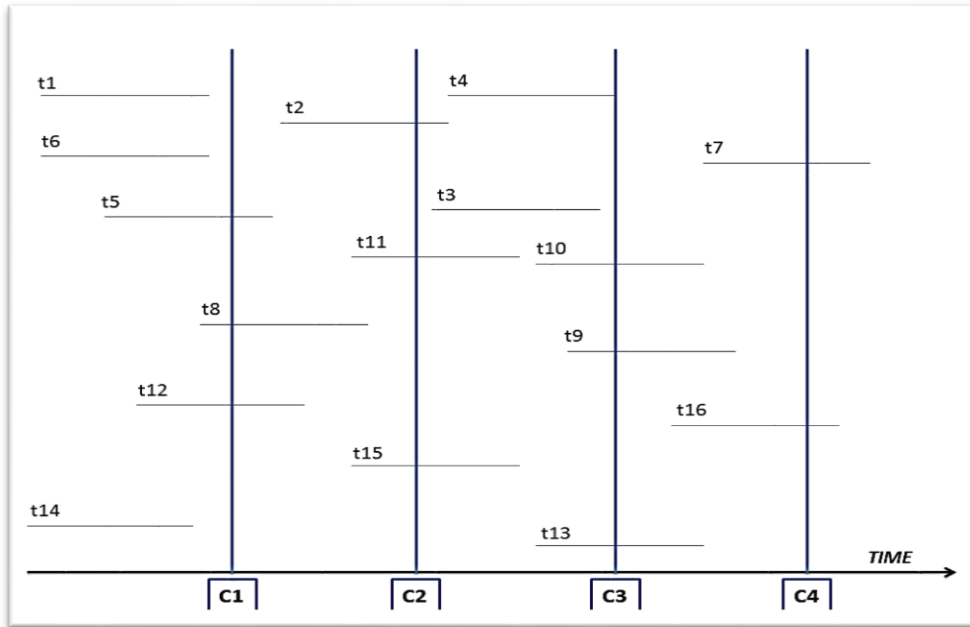
- 5.1.  $C \rightarrow D, C \rightarrow A, B \rightarrow C$   
 5.2.  $B \rightarrow C, D \rightarrow A$   
 5.3.  $ABC \rightarrow D, D \rightarrow A$   
 5.4.  $A \rightarrow B, BC \rightarrow D, A \rightarrow C$   
 5.5.  $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$

- Q6. Which of the following schedules is (conflict) serializable? Explain with the help of precedence graph. [10]

For each serializable schedule, determine the equivalent serial schedules.

- 6.1 r1 (X); r3 (X); w1(X); r2(X); w3(X) (2Marks)  
 6.2 r1 (X); r3 (X); w3(X); w1(X); r2(X) (2Marks)  
 6.3 r3 (X); r2 (X); w3(X); r1(X); w1(X) (2Marks)  
 6.4 r3 (X); r2 (X); r1(X); w3(X); w1(X)(2Marks)

- Q7 Consider the below snapshot of concurrent execution for immediate update of recovery. [10]

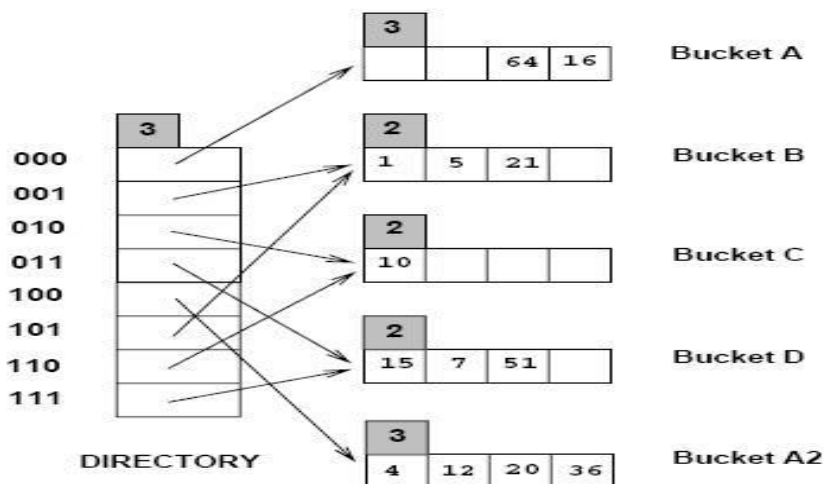


Assuming Check Points: C1, C2, C3, C4 and Transactions: t1, t2.... t16; what are the outcomes of the following tables at all the above 4 check points? [2.5X 4 = 10]

- I. Active Table
- II. Commit Table

Q8. Consider the Extendible Hashing index shown in Figure below. Answer the following questions about this index: [10]

- 8.1. What can you say about the last entry that was inserted into the index?
- 8.2. What can you say about the last entry that was inserted into the index if you know that there have been no deletions from this index so far?
- 8.3. Suppose you are told that there have been no deletions from this index so far. What can you say about the last entry whose insertion into the index caused a split?
- 8.4. Show the index after inserting an entry with hash value 68.
- 8.5. Show the index after inserting entries with hash values 17 and 69.
- 8.6. Show the index after deleting the entry with hash value 21. (Assume that the full deletion algorithm is used.)
- 8.7. Show the index after deleting the entry with hash value 10. Is a merge triggered by this deletion? If not, explain why. (Assume that the full deletion algorithm is used.)



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