VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

FALL SEMESTER – 2024-25

Continuous Assessment Test (CAT) - II

Programme: B.Tech – CSE **Course Code:** BCSE302L **Course Title:** Database Systems
Slot: A1+TA1 **Exam Date:** 13-10-2024 **Exam Time:** 9.30AM to 11.00AM
Total Marks: 50

General Instructions (if any): ***Open Book Examination – Answer all the questions.***

<table>
<tr><th>Q. No.</th><th>Question Text</th><th>Marks</th><th>CO</th></tr>
<tr><td>1.</td><td>a. Check R1 and R2 for BCNF, if it is not in BCNF, convert it into BCNF:
R1 (elevator_no, building_no, capacity, building_name)
FD = {elevator_no→building_no,capacity and building_no→ building_name}
R2 (elevator_no, building_no, capacity)
b. Identify the MVDs present in the table and normalize it to 4NF.
<table>
<tr><th>Name</th><th>Areacode</th><th>Phone</th><th>likes</th><th>manufacturer</th></tr>
<tr><td>Abi</td><td>632014</td><td>555-1111</td><td>Strawberry</td><td>Tata</td></tr>
<tr><td>Abi</td><td>632014</td><td>555-1111</td><td>chocolate</td><td>Britania</td></tr>
<tr><td>Abi</td><td>632224</td><td>555-1199</td><td>Strawberry</td><td>Tata</td></tr>
<tr><td>Abi</td><td>632224</td><td>555-1199</td><td>chocolate</td><td>Britania</td></tr>
</table></td><td>10</td><td>CO2</td></tr>
<tr><td>2.</td><td>Consider the block size of 256 bytes and block pointer of size 6 byte and search key value of 5bytes and 3bytes for primary index and clustering index on an ordered field respectively. Size of each entry in the data file is 20bytes with 50000 records and record pointer of size 5 bytes. Clustering index has 500 zipcode values..
i) Find the blocking factor for the data file, primary and clustering index.
ii) Find the number of blocks required for data file, primary and clustering index
iii) For the primary and clustering index - calculate the number of accesses needed.
iv) Find the order p and p_{leaf} of a B^+- tree and also the number of index entries in each level of the tree for clustering index.</td><td>10</td><td>CO3</td></tr>
<tr><td>3.</td><td>Derive equivalent relational Algebra expression/SQL for the following:
i) Select movieTitle From MovieStar Where starName = name AND birthyear = 1960
ii) SELECT movieTitle FROM StarsIn, (SELECT name FROM MovieStar WHERE birthdate = 1960) M WHERE starName = M.name
iii) Find the fname and lname of employees in departmentno 4 that earn > 50000
iv) $\pi_{Id,Name}$ ($\sigma_{Hobby='stamps' \text{ OR } Hobby='coins'}$ (Person))
v) $\pi_{StudId,CrsCode}$ ($\sigma_{Grade \neq 'F'}$ (Transcript))</td><td>10</td><td>CO2</td></tr>
<tr><td>4.</td><td>Find the optimal query tree for the SQL query and explain the steps in detail.
Select P.Pnumber, P.Dnum, D.Address
From Project as P, Department as D
Where P.Dnum=D.Dnumber And D.location='SJT' And D.name=CSE</td><td>10</td><td>CO2</td></tr>
<tr><td>5.</td><td>Draw the precedence graph for the schedule of 4 transactions: W3(B), R1(C), W4(B), W4(A), R1(A), W3(C), W2(A), R2(D), W2(B), R3(D). Identify whether it is conflict serializable or not? Present the equivalent serial schedules.</td><td>10</td><td>CO4</td></tr>
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********** ALL THE BEST **********