Course Code: 10M11CI113

Max. Marks: 35

Course Name: ADVANCED DATABASE SYSTEMS

Max. Time: 2 HRS

Course Credit: 4

Note: All questions are compulsory

Group-A

1. Solve the MCQ [1X10=10]

1] [CO-2] MongoDB supports sharding through the configuration of a sharded _____
a) shapes
b) clusters
c) sets
d) all of the mentioned

2][CO-5] Suppose a database has the following schema:

Trip (fromAddrId: INTEGER, toAddrId: INTEGER, date: DATE)

Address (id: INTEGER, street: STRING, townState: STRING)

The query SELECT A.street FROM Address A, Trip T WHERE A.id=T.toAddrId AND A.townState='Waknaghat' AND T.date='11/12/18' returns

a) the street of all addresses in 'Waknaghat' that are destination of a trip on '11/12/18'.
b) the all address in 'Waknaghat' that are destination of a trip on '11/12/18'.
c) the street of all addresses in 'Waknaghat' that are source of a trip on '11/12/18'.
d) the all address in 'Waknaghat' that are source of a trip on '11/12/18'.

3][CO-5] Evaluate this SQL statement:

```
SELECT employee_id, e.department_id, department_name, salary
FROM employees e, departments d
WHERE e.department_id = d.department_id;
```

Which SQL statement is equivalent to the above SQL statement?

```
a) SELECT employee_id, department_id, department_name, salary
FROM employees
WHERE department_id IN (SELECT department_id
```
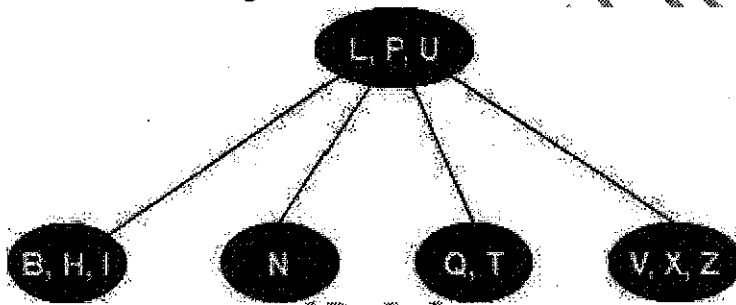
FROM departments);

b) SELECT employee_id, department_id, department_name, salary
FROM employees
NATURAL JOIN departments;

c) SELECT employee_id, d.department_id, department_name, salary
FROM employees e
JOIN departments d
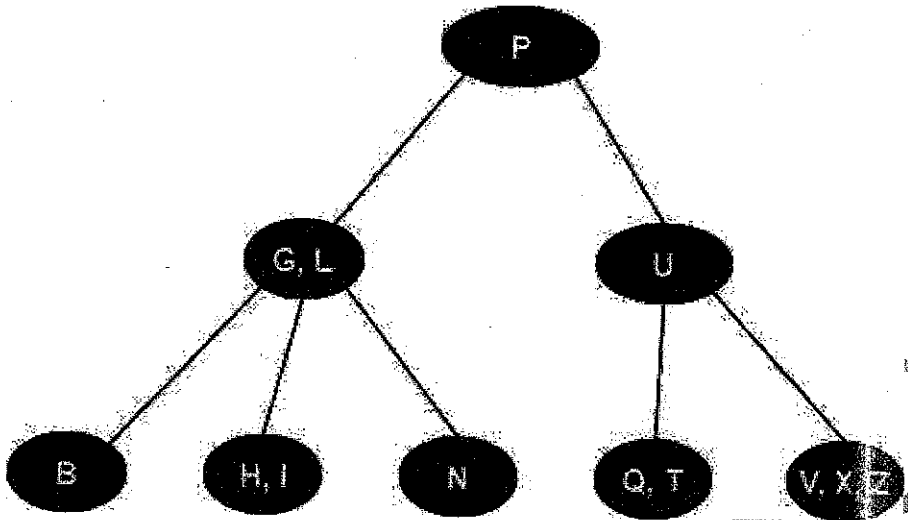ON e.department_id = d.department_id;

d) SELECT employee_id, department_id, department_name, salary
FROM employees
JOIN departments
USING (e.department_id, d.department_id);

4][**CO-1**] Consider the following 2-3-4 tree (i.e., B-tree with a minimum degree of two and a maximum degree of 4) in which each data item is a letter. The usual alphabetical ordering of letters is used in constructing the tree.
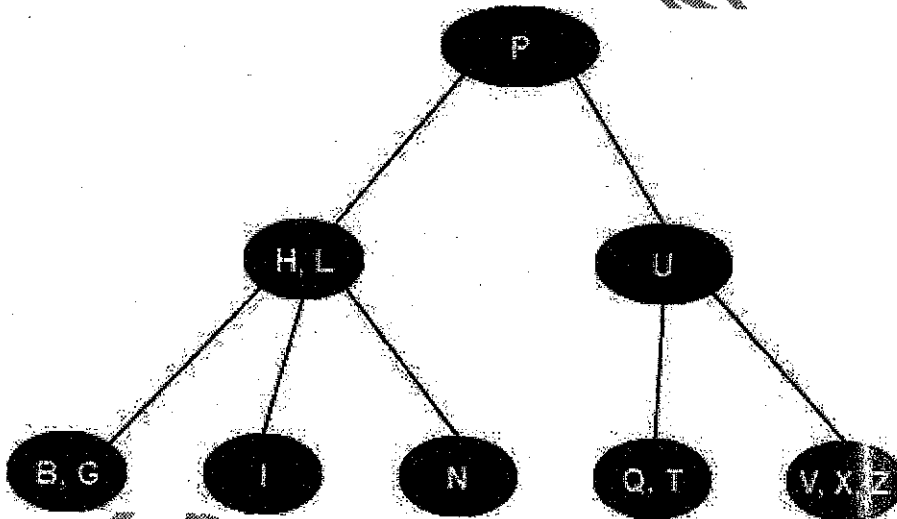

What is the result of inserting G in the above tree?

(a)

P

G, L   U

B   H, I   N   Q, T   V, X, Z

(b)

P

H, L   U

B, G   I   N   Q, T   V, X, Z

(c)

I, P, U

B, G, H   L, N   Q, T   V, X, Z
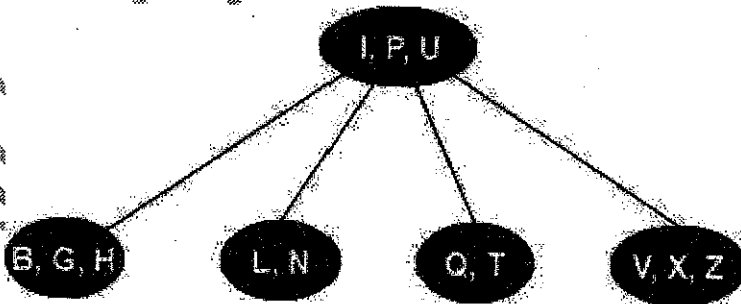
(d) None

5] [CO-1] Consider a B+-tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node?
(a) 1

3

(b) 2

(c) 3

(d) 4

6] **[CO-5]** Estimate the cost of r X s using

(1) Sort-merge join

(2) Block nested loops

where r has 1,000 tuples, 20 tuples per page; s has 2,000 tuples, 4 tuples per page; and the main memory buffer for this operation is 22 pages long.

    a) Sort-merge join=6200 & block nested loop=1600
    b) Sort-merge join=5200 & block nested loop=1500
    c) sort-merge join=4200 & block nested loop=1400
    d) Sort-merge join=3200 & block nested loop=1300

7] **[CO-3]** Which one of the following statements is FALSE?

    a) Any relation with two attributes is in BCNF

    b) A relation in which every key has only one attribute is in 2NF

    c) A prime attribute can be transitively dependent on a key in a 3 NF relation

    d) A prime attribute can be transitively dependent on a key in a BCNF relation

8] **[CO-2]** In a Bioinformatics Database what component is absent?

    a) Machine Learning tools or soft wares

    b) Query processor

    c) GUI to show the result

    d) None of these

9] **[CO-1]** Which one of the following is not database model:

    (a)   Relational Model   (b)   Step Model

    (c)   Network Model   (d)   ER Model

4

10] [CO-3] _____ predicts future trends & behaviors, allowing business managers to make proactive,knowledge-driven decisions.

    a. Data warehouse.
    b. Data mining.
    c. Datamarts.
    d. Metadata

Group-B

2. **[CO-4 & CO-6]** Write two pitfalls of Two Phase Locking Protocol (2PL).Discuss Basic 2PL,Conservative 2PL,Strict 2PL and Rigorous 2PL. [1+4=5]

3. **[CO-2]** Write the algorithm for Parallel Sorting using **Range Partitioning** in multiprocessor system. [4]

4. **[CO-3]** Compare OLAP vs OLTP [3]

5. **[CO-2]** Discuss DBMS vs DSMS both similarities and differences. [3]

6. **[CO-5]** Define [1 X 4 = 4 marks]
    a) Theta Join
    b) Equi Join
    c) Natural Join
    d) Full Outer Join

7. **[CO-1]** Discuss "Page Rank Algorithm" implemented by Google Inc. [3]

8. **[CO-6]** What is "Durability" property of ACID? How it is maintained –discuss the tools or techniques. [1+2=3]