Instructions: 1. **Total Marks: 20   Duration 1 Hour (07 PM – 08 PM)**
2. Date: **05-04-2022**
3. **Write your Roll Number, Name and upload pdf file in Microsoft Team**

1. Consider the following database scheme:

$$employee(employee\_name, street, city)$$
$$works(employee\_name, company\_name, salary)$$
$$company(company\_name, city)$$
$$manages(employee\_name, manager\_name)$$

Give an expression in SQL for each of the following queries:
a) Find the names, street address, and cities of residence for all employees who work for company "ABC" and earn more than Rs-10,000.
b) Find the names of all employees in the database who live in the same cities and on the same streets as do their managers.
c) Find the names of all employees who earn more than the average salary of all employees of their company. Assume that all people work for at most one company.
d) Assume that the companies may be located in several cities. Find all companies located in every city in which company "XYZ" is located.

(5M)

2. Consider the following database scheme:
   Teacher (t_name, Dept, t_no, s_title), Student (s_name, course, hall),
   Study (s_title, s_name, level, status, marks). Express the following queries in QUEL:
   i.   Find the name of subjects such that all students studying the subject secure more than 80 marks.
   ii. Find the maximum marks secure in each subjects of the CSDP course.
   iii. Find the students of CSDP course leaving LBS hall or in MT hall who study no subject taught by ABC.

(4M)

P.T.O.

3. a) Suppose that we are using extendable hashing on a file that contains records with following search
key values:

        44, 120, 204, 72, 288, 148, 50, 124, 65, 104, 66, 114

Show the extendable hash structure for this file if the hash function is *h(key)= key mod*

64 and buckets can hold four records.

b) Construct a B+-tree for the following set of key values (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that each block can contain at most three records and each intermediate node can store maximum of two key values and corresponding addresses. Now perform the following operations in sequence:
  i.   Insert record with key value 9 and insert record with key value 20
  ii.   Delete record with key value 17.

c) Distinguish between dense index and sparse index. With the help of example, explain when a sparse index will be preferable.

d) If a data file uses hashed file organization, is it possible to perform range queries on a search key values? Justify your answer with appropriate example.

<div align="right">(3M+4M+2M+2M)</div>

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