Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Databases **Semester : 3**

Program: B.Sc. CS **Time : 03 hrs.**

Course Code: CSEG2058 **Max. Marks: 100**

Instructions: No calculators are allowed. Write to-the-point answers and do not fill the answers with excess explanation.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write two advantages and two disadvantages of a client-server based architecture. (150 words max)	**4**	**CO1**
Q2	Write four different components of an Entity-relationship diagram. Draw the symbols and briefly describe what each means. (1 page max)	**4**	**CO1**
Q3	Describe the four types of relational algebra operators with examples of each. (100 words max).	**4**	**CO2**
Q4	What is functional dependency with respect to databases? Write the mathematical representation. (150 words max)	**4**	**CO3**
Q5	List the various datatypes that a state-of-the-art database can recognize. Explain any four of them. (150 words max)	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q6	What is an integrity constraint with reference to databases? Are they implicit or explicit constraints? Describe each type of integrity constraint with examples. (250 words)	**2+2+6=10**	**CO4**
Q7	Table **Customer**: **Cust name** | **Street** | **City** A | abc | Delhi B | xyz | Mumbai Table **Loan**: **Loan no.** | **Branch Name** | **Amount** L01 | Main | 200 L02 | Sub | 150 Table **Borrower**: **Cust Name** | **Loan no.** A | L02	**5+5=10**	**CO2**

<table>
<tr><td></td><td>Given the above three tables, write the relational calculus for the following:
a) Find the loan number, branch, amount of loans of greater than or equal to 150.
b) Find the names of all customers having a loan at the “Main” branch and find the loan amount.</td><td></td><td></td></tr>
<tr><td>Q8</td><td>What is participation constraint? How many types are there? Explain each type with an example and proper diagram. (200 words max)</td><td>2+8=10</td><td>CO1</td></tr>
<tr><td>Q9</td><td>What is a database transaction? Provide a real-life scenario where a transaction occurs in a database. Draw the state transition diagram for a database transaction, label the parts properly with correct directionality of the arrows. (150 words max)
OR
What do you mean by anomaly in a transaction database? Describe any two anomalies. Provide transaction pseudocodes and clearly justify why the anomaly occurs. (200 words max)</td><td>(2+3+5)
OR
(2+4+4)
=10</td><td>CO4</td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q10</td><td>Consider the UNIVERSITY database that consists of the following table representing students and the subjects that they have opted.
Table A:
<table>
<tr><td>Stu_id</td><td>Sub</td><td>Professor</td></tr>
<tr><td>1</td><td>SQL</td><td>Prof. Mishra</td></tr>
<tr><td>2</td><td>Java</td><td>Prof. Anand</td></tr>
<tr><td>2</td><td>C++</td><td>Prof. Kanth</td></tr>
<tr><td>3</td><td>Java</td><td>Prof. James</td></tr>
<tr><td>4</td><td>DBMS</td><td>Prof. Lokesh</td></tr>
</table>
a) What is the primary key of the above table? Justify your choice.
b) Identify the normal form that the database is in. Provide an analysis starting from the first normal form. Your answer should be written as:
i. 1NF: <write if the database is in 1NF, and why>
ii. 2NF: <write if the database is in 2NF, and why>, etc.
iii. Write till you reach a point where the database does not follow that normal form.
c) Convert the database into the next higher normal form. Clearly state what criteria you have fulfilled for the database to be considered the next higher normal form. For example, if you have converted from 1NF to 2NF, mention:
i. “Converting from 1NF to 2NF”
ii. Perform the conversion
iii. State the conditions of 2NF that the database follows after the conversion
(250 words max)</td><td>2+3+5 =10</td><td>CO3</td></tr>
</table>

Q11	a) What is SQL query processing and what is its use? Draw the block diagram for a basic query processor. Label each part properly. Describe the basic steps in processing an SQL query and the purpose of those steps. (2 pages max) **OR** b) I want to search for some data in a database and display the result of the query. Describe four techniques that I can use to create algorithms to search for the data in the database. For each technique, mention one advantage and one disadvantage. (2 pages max)	**(5+5+10) OR (4*5) =20**	**CO4**