VIT
UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CAT-II

Course	: B.Tech	Year	: II
Semester	: III	SLOT	: D1
Subject	: Database Management Systems	Subject Code	: CSE2004
Duration	: 90 Minutes	Max. Marks	: 50

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Answer All the Questions (5 *10=50)

1. a) Derive the proof for the following inference rules using Armstrong's axiom. [5]

$\{X \rightarrow Y, XY \rightarrow Z\} \models \{X \rightarrow Z\}$
$\{X \rightarrow Y, Z \rightarrow W\} \models \{XZ \rightarrow YW\}$
$\{X \rightarrow YZ, Z \rightarrow W\} = \{X \rightarrow W\}$

b) A relation R(A,B,C,D,E,H) has the following functional dependencies F= {{A→BC},{CD→E},{E→C}, {D→AEH}, {ABH→BD}, {DH→BC}}. Find the keys and determine the highest normal form satisfied by the relation [5]

2. a. Given below are two sets of functional dependencies for a relation R(A,B,C,D,E). Are they equivalent? [5]
   a. A→ B, AB→C, D→AC, D→E
   b. A→BC, D→AE

b. A set of functional dependencies for the relation R(A,B,C,D,E,F) is AB→C, C→A, BC→D, ACD→B, BE→C, EC→FA, CF→BD, D→E. Find a minimal cover for this set of functional dependencies. [5]

3. The table lists agents, the companies they work for and the policies they sell for those companies. Is it possible to remove the redundancy of data in the given table by decomposition? Justify your answer. If yes, list the decompositions and identify the normal form of the decomposed relations. [10]

Agent	Company	Policies
Jeff	USAA	Policy1
Jeff	USAA	Policy2
Jeff	AXA	Policy3
Chris	USAA	Policy3

4. a. State if the following statement is **True** or **False**.
It is possible that a loss-less decomposition does not exhibit dependency preservation. [2]

b. Normalize the following relation in 2NF to 3NF. [3]

t(cust_id,name,salesperson,region)

cust_id→name

cust_id→salesperson

cust_id→region

salesperson→region

i. t1 (<u>cust_id</u>, name, salesperson); t2 (<u>salesperson</u>, region).

ii. t1 (<u>cust_id</u>,name,salesperson); t2 (region).

iii. t1 (<u>cust_id</u>, name); t2 (<u>salesperson</u>, region).

iv. The relation is not in 2NF.

c. Normalize the following relation to BCNF.[5]

CI(clientNo,interviewDate,interviewTime,staffNo,roomNo)

clientNo,interviewDate→interviewTime,staffNo,roomNo

stafftNo,interviewDate,interviewTime→clientNo,roomNo

stafftNo,interviewDate→roomNo

i.I(<u>clientNo,interviewDate</u>,interviewTime,roomNo)

S(<u>stafftNo,interviewDate</u>,roomNo)

ii.I(clientNo,interviewDate,interviewTime,staffNo)
S(interviewDate,roomNo)

iii.I(clientNo,interviewDate,interviewTime,staffNo)
S(stafftNo,roomNo)

iv.I(clientNo,interviewDate,interviewTime,staffNo)
S(stafftNo,interviewDate,roomNo)

5. Consider a database with the following schema:

a. Person (name, age, gender)
b. Frequents (name, pizzeria)
c. Eats (name, pizza)
d. Serves (pizzeria, pizza, price)

Write relational algebra expressions for the following queries. [10]

I. Find the names of all females who eat either mushroom or pepperoni pizza (or both).

II. Find the names of all people who frequent only pizzerias serving at least one pizza they eat.

III. Find the pizzeria serving the cheapest pepperoni pizza. In the case of ties, return all of the cheapest-pepperoni pizzerias

IV. Find the total count of people taking a specific pizza for each pizzeria

V. Find the total count of people who are interested in pizzas that are priced between 200 and 400 rupees