Roll Number: _____   Name: _____   Group No. _____

| Auxiliary & U Grade Exam	Subject: UCS310 DBMS
Date- March 05, 2022	Time: 02 Hours
Name of Faculty: JC	

- Attempt any **Five** questions

Q 1:

a) UPS prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, UPS relies on a company-wide information system. Shipped items are the heart of the UPS product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the UPS system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard UPS transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.

Design an ER diagram to capture the above requirements. Indicate identifiers and cardinality constraints. (5)

b) Find the minimum number of tables required to represent the given ER diagram in relational model. Give details/entries of each table. (4)
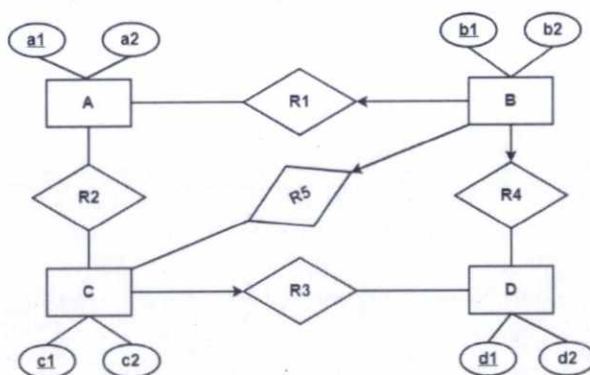
Q 2: a) Given a relation R(P, Q, R, S, T) and Functional Dependency set FD = { PQ → R, S → T }, determine whether the given R is in 2NF? If not convert it into 2 NF. (4)

b) **Explain the following:** (5)

   I. 3NF
   II. BCNF

III. Armstrong's Axioms
IV. Trival vs Non-trival Functional Dependency
V. Difference b/w Normalization and Denormalization

Q3:

(a) Explain the importance of Data Independence? Difference between Logical and Physical Data Independence? Which one is harder to achieve? Why? (5)

(b) Consider the following relations A, B, C. How many tuples does the result of the following relational algebra expression contain? Explain. (2)
Assume that the schema of A U B is the same as that of A.

$$(A \cup B) \bowtie_{A.Id > 40 \ v \ C.Id < 15} C$$

Table A

ID	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

Table B

ID	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

Table C

ID	Ph. No.	Area
10	2200	02
99	2100	01

c) Explain the constraints of RDBMS with examples (2)

Q4: Write relational algebra for given questions. (9)

Employee(FName, LName, SSN*, BDate, Address, Sex, Salary, SuperSSN, Dno)
Department(Dnumber* , Dname, MgrSSN)
Dept_Location(Dno*, Dlocation*)
Project(Pname, Pnumber*, Plocation, Dno)
Works_On(Essn, Pno, Hours)
Dependent(Essn, Depent_Name, Sex, Bdate, Relationship)

a) Retrieve the names of all employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

b) List the names of all employees who have a dependent with the same first name as themselves.

c) Find the names of all employees who are directly supervised by 'Franklin Wong'.

d) For each project, list the project name and the total hours per week (by all employees) spent on that project.

e) Retrieve the names of all employees who work on every project.

f) Retrieve the names of all employees who do not work on any project.

g) For each department, retrieve the department name and the average salary of all employees working in that department.

h) Retrieve the average salary of all female employees.

i) Find the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston.

Q5:
   a) Decompose the relation to the highest normal form. (6)

CustNo	Cname	PropNo	PAddr	RntSt	RntFnsh	Rent	OwnerNo	OName
CR76	John Kay	PG4	6 Lawrence St, Elmont	7/1/10	8/31/06	700	CO40	Tina Murphy
		PG16	5 Nova Dr, East Meadow	9/1/06	9/1/08	900	CO93	Tony Shaw
CR56	Aline Stewart	PG4	6 Lawrence St, Elmont	9/1/02	6/10/04	700	CO40	Tina Murphy
		PG36	2 Manor Rd Scarsdale	8/1/04	12/1/05	750	CO93	Tony Shaw
		PG16	5 Nova Dr, East Meadow	8/1/06	9/1/10	900	CO93	Tony Shaw

   b) Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F={CH->G, A->BC, B->CFH, E->A, F->EG} is a set of functional dependencies (FDs) so that F + is exactly the set of FDs that hold for R. How many candidate keys does the relation R have? Explain. (3)

Q6:

   a) Define entity set and also differentiate between weak entity set and strong entity set in respect of primary key. (4)
   b) Explain the entity Integrity and referential integrity constraints in detail. Why each is considered important. Explain with examples. (5)

Q7:
   a) Discuss the problems generated due to redundant information in tuples and update anomalies. (2)
   b) You have two tables, EMPLOYEE and COMPUTER that are in a one-to-one relationship. The foreign key is EmpNumber in COMPUTER which references EmpNumber as the primary key of EMPLOYEE. Explain what must be done to convert the one-to-one EMPLOYEE-COMPUTER relationship to a one-to-many relationship where one employee can have more than one computer. (3)
   c) Describe DBMS architecture and explain why it is known as three-tier architecture. (4)