

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION MO/SP20\*\*)**

**CLASS: MCA & Pre-PHD  
BRANCH: MCA**

**SEMESTER : I  
SESSION : MO/2022**

**SUBJECT: CA407 DATABASE DESIGN CONCEPTS**

**TIME: 03 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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- Q.1(a) Distinguish between logical and physical data independence [2]  
Q.1(b) Outline each of different database users and their ways to interact with a database. [3]  
Q.1(c) Draw the complete architecture with component modules of a DBMS. [5]
- Q.2(a) Illustrate with one example a user defined and condition defined constraint in specialization. [2]  
Q.2(b) Describe what is a participation role? Under what conditions can an attribute of a binary relationship be migrated to become an attribute of one of the participating entity type? Explain with an example. [3]  
Q.2(c) Draw an ER model to represent a university database with the following constraints. The courses are distinguished with course IDs and the professors with employee Id while students have distinct roll numbers. The model must represent mapping cardinality and degree. What would be the minimum number of tables required for this database. [5]  
1. Professors can teach the same course for several semesters and each course offering is recorded.  
2. Each student enrolls in exactly one course.  
3. Each professor teaches at least one course while some professors may teach multiple courses
- Q.3(a) Define functional and multi valued dependency [2]  
Q.3(b) Consider the database: [3]  
Supplier(Sno, Sname, City, rating)  
Parts(partno, partname, weight, color)  
Catalog(Sno, Partno, Qty, Price, shipmentdate)  
Write queries in RA  
1. Get partnames that are supplied entirely by one supplier whose rating is greater than supplier 'S1'  
2. For each part supplied to each supplier located at Mumbai, get the part number and shipment weight.
- Q.3(c) For the above mentioned database, write queries in SQL: [5]  
1. Find the supplier names of suppliers that supply at least those parts that are supplied by any supplier in Mumbai.  
2. Find the shipment weight and date for every red or blue part supplied by every supplier.  
3. Get part names for parts supplied to all projects in Mumbai.
- Q.4(a) Define the term cascading rollbacks. [2]  
Q.4(b) Explain all versions of 2 phase locking protocol [3]  
Q.4(c) Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below. The schedules represent the sequence of operations. Draw the precedence graph and determine whether the schedules are conflict serializable or not. [5]  
T1: r1(X); r1(Z); w1(X); w1(Z)  
T2: r2(Y); r2(Z); w2(Z)  
T3: r3(Y); r3(X); w3(Y)  
S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z);  
w3(Y); w2(Z); r1(Z); w1(X); w1(Z)  
S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);  
r2(Z); w3(Y); w1(X); w2(Z); w1(Z)
- Q.5(a) Differentiate between heterogeneous and homogeneous databases [2]  
Q.5(b) Explain with examples types of data fragmentation. [3]  
Q.5(c) Explain why is data replication useful in DDBMS? Also write 2 desirable properties of DDBMS [5]