Mahindra University Hyderabad

École Centrale School of Engineering
End Semester / Regular

Program: B.Tech/M.Tech **Branch: CSE/AI/ECE/CM/AI&DS** **Year: III / I** **Semester: I**
Subject: Database Management Systems (CS/AI 3103 / AI 5101)

Date: 21/12/2023 **Start Time: 10.00 AM**
Time Duration: 3 Hours **Max. Marks: 100 Marks**

Instructions:

1) All parts of a question should be answered consecutively.
2) Mobile phones and computers of any kind should not be brought inside the exam hall.
3) Use of any unfair means will result in severe disciplinary action.

Q1. Answer the following. Each wrong answer consists of 0.5 Mark negative marking. **[10*2=20M]**

1.1. Which one of the options given below refers to the degree (or arity) of relation in relational database systems?
(A) Number of attributes of its relation schema.
(B) Number of tuples stored in the relation.
(C) Number of entries in the relation.
(D) Number of distinct domains of its relation schema.

1.2. In a relational data model, which one of the following statements is TRUE?
(A) A relation with only two attributes is always in BCNF.
(B) If all attributes of a relation are prime attributes, then the relation is in BCNF.
(C) Every relation has at least one non-prime attribute.
(D) BCNF decompositions preserve functional dependencies.

1.3. Which one of the following is used to represent the supporting many-one relationships of a weak entity set in an entity-relationship diagram?
(A) Diamonds with double/bold border
(B) Rectangles with double/bold border
(C) Ovals with double/bold border
(D) Ovals that contain underlined identifiers

1.4. A prime attribute of a relation scheme R is an attribute that appears
(A) in all candidate keys of R.
(B) in some candidate keys of R.
(C) In a foreign key of R.
(D) only in the primary key of R.

1.5. Given the basic ER and relational models, which of the following is INCORRECT?
(A) An attribute of an entity can have more than one value.
(B) An attribute of an entity can be composite.
(C) In a row of a relational table, an attribute can have more than one value.
(D) In a row of a relational table, an attribute can have exactly one value or a NULL value.

1.6. Abstraction of the architecture of the database can be viewed as
(A) two levels (B) four levels
(C) three levels (D) one level

1.7. The way a particular application views the data from the database that the application uses is a
(A) module
(B) relational model
(C) schema
(D) sub schema

1.8. _____ is, a table having more than one set of attributes that could be chosen as the key.
(A) Foreign key
(B) Integrity key
(C) Relationship
(D) Candidate key

1.9. Related fields in a database are grouped to form a
(A) data file (B) data record
(C) menu (D) bank

1.10. The _____ refers to the way data is organized in and accessible from DBMS.
(A) database hierarchy
(B) data organization
(C) data sharing
(D) data model

Q2. Transaction & Concurrency Control **[2*10=20M]**

2.1.

Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.
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)
Analyze which one of the schedules is conflict-serializable?

2.2.

Consider the following transactions with data items P and Q initialized to zero:

T1: read(P);
read(Q);
If P=0 then Q:=Q+1;
write(Q);

T2: read(Q);
read(P);
If Q=0 then P:=P+1;
write(P);

Solve and find any non-serial interleaving of T1 and T2 for concurrent execution leads to a serializable schedule or non-serializable schedule. Explain?

Q3. **[2*10=20M]**

3.1. Let E1 and E2 be two entities in an E/R diagram with simple single-valued attributes. R1 and R2 are two relationships between E1 and E2, where R1 is one1 to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. Calculate the minimum number of tables required to represent this situation in the relational model?

3.2. By refereeing the following Database schema.

Employee(Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary, Sup_SSN,Dno)
Department(Dname, Dnumber, Mgr_SSN, Mgr_Start_date)
Dept_Locations(Dnumber, Dlocation)
Project(Pname, Pnumber, Plocation, Dnum)
Works_On(Essn, Pno, Hours)
Dependent (Essn, Dependent_Name, Sex, Bdate, Relationship)

Write the relational algebra expressions for the following queries

(i) Retrieve all the employee names who are working for department number 5.
(ii) Retrieve all the projects which are controlled by department number 4.
(iii) Retrieve the names of employees who have no dependents.
(iv) Retrieve all the Employee Name who is working on all the projects in which John Smith works on.
(v) Retrieve all the project numbers along with number of employee working on each project

Q4.

Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Choose the most appropriate option, enter your choice in the answer sheet therein. **Each wrong answer consists of 0.5 Mark negative marking.** **[10*2=20M]**

A. Exclusive	F. normalization	K. secondary
B. Project	G. Select	L. attribute
C. shared	H. Primary key	M. stringent
D. Logical	I. Field	
E. Document	J. Join	