**CS513**

USN	1	M	S						
-----	---	---	---	--	--	--	--	--	--

# **M S RAMAIAH INSTITUTE OF TECHNOLOGY**

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

## **SEMESTER END EXAMINATIONS – JANUARY 2015**

Course & Branch : **B.E.- Computer Science and Engineering Semester : V**  
Subject : **Database Systems** Max. Marks : **100**  
Subject Code : **CS513** Duration : **3 Hrs**

### **Instructions to the Candidates:**

- Answer one full question from each unit.

### **UNIT – I**

1.
  - a) List and explain any 4 characteristics of database approach (05)
  - b) Describe the 3 schema architecture of a database system with a neat diagram (07)
  - c) Consider a movie database in which data is recorded about the movie industry. The data requirements are summarized as follows: (08)
    - Movies are identified by their title and year of release. They have a length in minutes. They also have a studio that produces the movie and are classified under one or more genres (such as horror, action, drama etc). Movies are directed by one or more directors and have one or more actors acting in them. The movie also has a plot outline. Each movie also has zero or more quotable quotes that are spoken by a particular actor acting in the movie.
    - Actors are identified by their names and date of birth and act in one or more movies. Each actor has a role in the movie.
    - Directors are also identified by their names and date of birth and direct one or more movies. It is possible for a director to act in a movie (not necessarily in a movie they direct).
    - Studios are identified by their names and have an address. They produce one or more movies.Design an Entity-Relationship diagram for the movie database
2.
  - a) List and explain any 4 advantages of using DBMS approach (05)
  - b) With a neat diagram, explain the component modules of a DBMS (08)
  - c) A company has decided to store in a database information on the musicians who perform for its albums. Design a conceptual schema for the company and draw an ER diagram for your schema. The following information describes the situation on which the company database must be modeled. Indicate all key and cardinality constraints. (07)

Each musician who records at this company has an SSN, a name, an address and a phone number.

Each instrument that is used in the songs has a name (ex:- guitar, synthesizer, flute) and a musical key (ex:- C, B-flat, E-flat).

Each album that is recorded on the company label has a title, a copyright date, a format (ex:- CD or MC) and an album identifier.



Each song recorded at the company has a title and an author.

Each musician may play several instruments and several musicians may play a given instrument.

Each album has a number of songs on it but no song may appear in more than one album.

One or more musicians perform each song and a musician may perform in a number of songs.

### UNIT – II

3. a) Explain the Domain, key, entity integrity, and referential integrity constraints with appropriate examples (07)
- b) With appropriate example, explain the ER to relational mapping algorithm in detail (08)
- c) Compare and contrast the outer join and outer union operations in relational algebra with appropriate examples (05)
4. a) Consider the following relational schema (12)

#### **EMPLOYEE**

(Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super\_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 Relational algebraic queries for the following:

- i) For every project located in Stafford, list the project number, the controlling department number, and the department manager's last name, address and birth date
- ii) Find the names of employees who work on all the projects controlled by department number 5
- iii) List the names of employees who have no dependents
- iv) For each department retrieve the department number, the number of employees working in the department and their average salary
- b) Consider the following relational schema: (08)

#### **EMPLOYEE**

(Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super\_ssn, Dno)

#### **DEPARTMENT**

(Dname, Dnumber, Mgr\_ssn, Mgr\_start\_date)

#### **DEPT\_LOCATIONS**

(Dnumber, Dlocation)

#### **PROJECT**

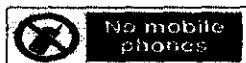
(Pname, Pnumber, Plocation, Dnum)

#### **WORKS\_ON**

(Essn, Pno, Hours)

#### **DEPENDENT**

(Essn, Dependent\_name, Sex, Bdate, Relationship)



Develop an ER diagram by reverse engineering from the relational schema specified above. Mention the assumptions made and show the cardinality ratios

**UNIT - III**

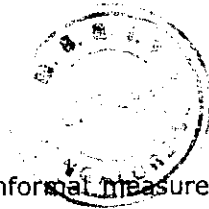
5. a) Consider the database schema for the ODI cricket database (08)  
Match(Matchid, Team1, Team2, Ground Date, Winner).  
Player(Playerid, Lname, Fname, Country, YBorn, Bplace, Ftest)  
Batting(Matchid, Playerid, Order, Hout, FOW, NRuns, Mts, Nballs, Fours, Sixes)  
Bowling(Matchid, Playerid, Novers, Maidens, Nruns, Nwickets)

Write SQL queries for the following

- Retrieve the name of the youngest player in India
  - Retrieve the names of players who have scored centuries in match 2689
  - Retrieve the names of the players whose last name starts with Sing
  - Find the number of players from the database in each country
- b) List and explain the different methods of view implementation? Also mention any 2 conditions to be satisfied for updating a view (07)
- c) What is meant by impedance mismatch? Bring out the problems faced by it and how it can be resolved (05)
6. a) Consider the following schema, write queries using SQL (10)  
Consider the following relation containing Airline flight information  
Flights (flight\_no, from, to, distance, departs, arrives)  
Aircraft (aircraft\_ID, aircraft name, cruising range)  
Certified ( emp\_ID, aircraft\_ID)  
Employee (Emp\_ID, ename, salary)  
i) Find the names of pilots certified for Boeing aircraft  
ii) Find the employee ID's of employee who make the highest salary.  
iii) Find the employees who are certified for the largest no of aircrafts.  
iv) Arrange the flight no with respect to the ascending order of distance.  
v) Find the name of pilots who can operate flights with a range greater than 3000 miles but are not certified on any Boeing aircraft.
- b) Describe the concept of a cursor and how it is used in embedded SQL with a program segment (10)

**UNIT - IV**

7. a) Prove the following inference rules for functional dependencies using inference rules (08)  
IR1 through IR6 .  
i)  $\{W \rightarrow Y, X \rightarrow Z\} \models \{WX \rightarrow Y\}$   
ii)  $\{X \rightarrow Y, X \rightarrow W, WY \rightarrow Z\} \models \{X \rightarrow Z\}$   
iii)  $\{X \rightarrow Y, XY \rightarrow Z\} \models \{X \rightarrow Z\}$   
iv)  $\{X \rightarrow Y, Y \rightarrow Z\} \models \{X \rightarrow YZ\}$
- b) A set of FD's for the relation R {A,B,C,D} E:{B->A, D->A, AB->D}. Find a minimum cover for this set of FDs illustrating all the inferences used . (06)
- c) Define multi-valued dependency? Explain 4NF with a suitable example (06)



8. a) Discuss the 4 informal measures of quality for relation schema design with appropriate examples. (08)
- b) Define BOYCE-Codd normal form. How does it differ from 3NF? Why is it considered a stronger form of 3NF? (06)
- c) Given below are two sets of FDs for a relation  $R\{A,B,C\}$ . (06)  
Prove that they are equivalent  
 $F1 = \{A \rightarrow B, B \rightarrow C, C \rightarrow A\}$   
 $F2 = \{A \rightarrow C, C \rightarrow B, B \rightarrow A\}$

**UNIT - V**

9. a) Explain any 6 reasons for a transaction to fail in the middle of execution (06)
- b) Consider the three transactions  $T1$ ,  $T2$ , and  $T3$ , and the schedules  $S1$  and  $S2$  given below. Draw the serializability (precedence) graphs for  $S1$  and  $S2$ , and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). (10)
- $T1$ :  $r1(X); r1(Z); w1(X);$   
 $T2$ :  $r2(Z); r2(Y); w2(Z); w2(Y);$   
 $T3$ :  $r3(X); r3(Y); w3(Y);$   
 $S1$ :  $r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y);$   
 $S2$ :  $r1(X); r2(Z); r3(X); r1(Z); r2(Y); r3(Y); w1(X); w2(Z); w3(Y); w2(Y);$
- c) Write the procedure for recovery based on immediate update in multiple user environment (04)
10. a) With a neat diagram write and explain the state transition diagram illustrating the states for transaction execution (08)
- b) Which of the following schedules is (conflict) serializable? For each serializable schedule, determine the equivalent serial schedules. (08)
- i)  $r1(X); r3(X); w1(X); r2(X); w3(X);$   
ii)  $r1(X); r3(X); w3(X); w1(X); r2(X);$   
iii)  $r3(X); r2(X); w3(X); r1(X); w1(X);$   
iv)  $r3(X); r2(X); r1(X); w3(X); w1(X);$
- c) Briefly describe the wait-die and wound-wait protocols for deadlock prevention (04)

\*\*\*\*\*