United College of Engineering and Research, Allahabad

Department of Computer Science & Engineering

B.Tech CSE- V Semester

Set-2

Course Name: Database Management System **AKTU Course Code:** KCS-501

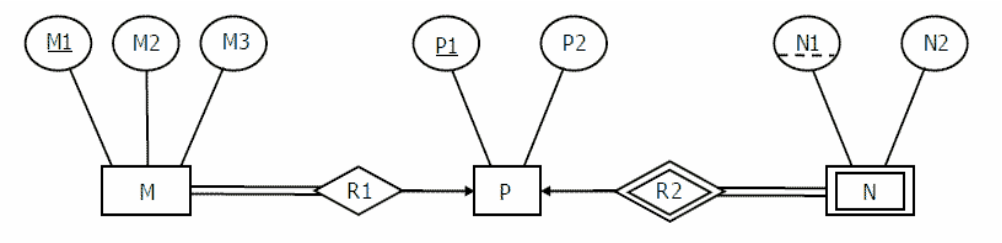
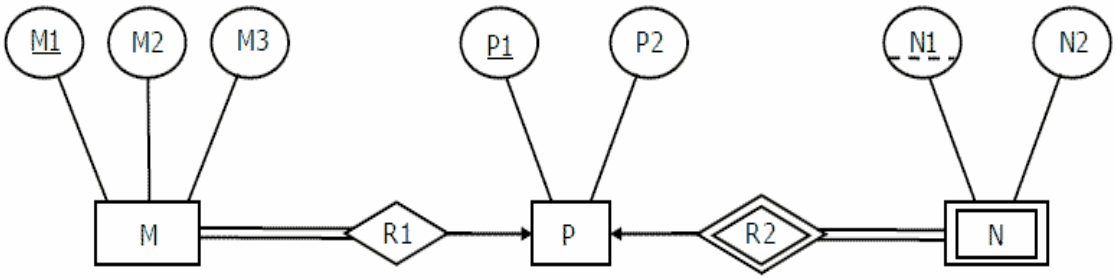
Time: 60 Minutes **Max. Marks: 40**

- **All Questions are compulsory.**
- **All Questions carry one mark.**

Q. No.	Questions
1	Which of the following is not an integrity constraint? (A) Not null (B) Positive (C) Unique (D) Check 'predicate'
2	Foreign key is the one in which the _____ of one relation is referenced in another relation. (A) Foreign key (B) Primary key (C) References (D) Check constraint
3	Data integrity constraints are used to: (A) Control who is allowed access to the data (B) Ensure that duplicate records are not entered into the table (C) Improve the quality of data entered for a specific property (i.e., table column) (D) Prevent users from changing the values stored in the table
4	Which of the following is a fundamental operation in relational algebra? (A) Set intersection (B) Natural join (C) Assignment (D) None of the mentioned
5	Consider the following relational schema. Students(rollno: integer, sname: string) Courses(courseno: integer, cname: string)

	Registration(rollno: integer, courseno: integer, percent: real) Which of the following queries are equivalent to this query in English? "Find the distinct names of all students who score more than 90% in the course numbered 107" (I) SELECT DISTINCT S.sname FROM Students as S, Registration as R WHERE R.rollno=S.rollno AND R.courseno=107 AND R.percent >90 (II) $\prod_{sname}(\sigma_{courseno=107 \wedge percent>90}$ (Registration $\bowtie$ Students)) (III) {T | $\exists$S$\in$ Students, $\exists$R$\in$ Registration (S.rollno=R.rollno $\wedge$ R.courseno=107 $\wedge$ R.percent>90 $\wedge$T.sname=S.sname)} (IV) {<S_N> | $\exists S_R \exists R_P$ (<S_R, S_N>$\in$ Students $\wedge$ <S_R, 107, R_P>$\in$ Registration $\wedge$ R_P>90)} (A) I, II, III and IV (B) I, II and III only (C) I, II and IV only (D) II, III and IV only
6	Suppose (A, B) and (C,D) are two relation schemas. Let r1 and r2 be the corresponding relation instances. B is a foreign key that refers to C in r2. If data in r1 and r2 satisfy referential integrity constraints, which of the following is ALWAYS TRUE? (A) $\Pi_B(r_1) - \Pi_C(r_2) = \emptyset$ (B) $\Pi_C(r_2) - \Pi_B(r_1) = \emptyset$ (C) $\Pi_B(r_1) = \Pi_C(r_2)$ (D) $\Pi_B(r_1) - \Pi_C(r_2) \neq \emptyset$
7	Consider the following relations A, B, C. How many tuples does the result of the following relational algebra expression contain? Assume that the schema of A U B is the same as that of A. $(A \cup B) \triangleright\!\triangleleft_{A.Id>40 \ v \ C.Id<15} C$ **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 Phone Area ---------- 10 2200 02 99 2100 01 (A) 7 (B) 4 (C) 5 (D) 9
8	Let R and S be two relations with the following schema R (P,Q,R1,R2,R3) S (P,Q,S1,S2) Where {P, Q} is the key for both schemas. Which of the following queries are equivalent? I. $\Pi_P (R \bowtie S)$ II. $\Pi_P (R) \bowtie \Pi_P (S)$ III. $\Pi_P (\Pi_{P,Q} (R) \cap \Pi_{P,Q} (S))$ IV. $\Pi_P (\Pi_{P,Q} (R) - (\Pi_{P,Q} (R) - \Pi_{P,Q} (S)))$ (A) Only I and II (B) Only I and III (C) Only I, II and III (D) Only I, III and IV

9	Consider the following ER diagram.  The minimum number of tables needed to represent M, N, P, R1, R2 is (A) 2 (B) 3 (C) 4 (D) 5
10	Consider the data given in above question. Which of the following is a correct attribute set for one of the tables for the correct answer to the above question?  (A) {M1, M2, M3, P1} (B) {M1, P1, N1, N2} (C) {M1, P1, N1} (D) {M1, P1}
11	Information about a collection of students is given by the relation *studinfo(studId, name, sex)*. The relation *enroll(studId, courseId)* gives which student has enrolled for (or taken) that course(s). Assume that every course is taken by at least one male and at least one female student. What does the following relational algebra expression represent? $\Pi_{\text{courseId}}\left(\left(\Pi_{\text{studId}}\left(\sigma_{sex=\text{"female"}}\left(\text{studInfo}\right)\right)\times\Pi_{\text{courseId}}\left(\text{enroll}\right)\right)-\text{enroll}\right)$

	(A) Courses in which all the female students are enrolled. (B) Courses in which a proper subset of female students are enrolled. (C) Courses in which only male students are enrolled. (D) None of the above
12	What is the optimized version of the relation algebra expression $\pi_{A1}(\pi_{A2}(\sigma_{F1}(\sigma_{F2}(r))))$, where $A1, A2$ are sets of attributes in r with $A1 \subset A2$ and $F1, F2$ are Boolean expressions based on the attributes in r? (A) $\pi_{A1}(\sigma_{(F1 \wedge F2)}(r))$ (B) $\pi_{A1}(\sigma_{(F1 \vee F2)}(r))$ (C) $\pi_{A2}(\sigma_{(F1 \wedge F2)}(r))$ (D) $\pi_{A2}(\sigma_{(F1 \vee F2)}(r))$
13	Consider the relational schema given below, where eId of the relation dependent is a foreign key referring to empId of the relation employee. Assume that every employee has at least one associated dependent in the dependent relation. employee (<u>empId</u>, empName, empAge) dependent(<u>depId</u>, eId, depName, depAge) Consider the following relational algebra query: The above query evaluates to the set of *empIds* of employees whose age is greater than that of $\prod_{\texttt{empId}}(\texttt{employee}) - \prod_{\texttt{empId}}(\texttt{employee} \bowtie_{(\texttt{empId = eID}) \wedge (\texttt{empAge} \leq \texttt{depAge})} \texttt{dependent})$ (A) some dependent. (B) all dependents. (C) some of his/her dependents (D) all of his/her dependents.
14	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 one-to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. What is the minimum number of tables required to represent this situation in the relational model? (A) 2

	(B) 3 (C) 4 (D) 5
15	Which of the following relational query languages have the same expressive power? 1. Relational algebra 2. Tuple relational calculus restricted to safe expressions 3. Domain relational calculus restricted to safe expressions (A) II and III only (B) I and II only (C) I and III only (D) I, II and III
16	Consider the join of a relation R with a relation S. If K has *m tuples* and S has *n tuples*, then the maximum and minimum sizes of the join respectively are: (A) m+n and 0 (B) mn and 0 (C) m+n and m-n (D) mn and m+n
17	The relational algebra expression equivalent to the following tuple calculus expression **{ t | t ∈ r ∧ (t[A] = 10 ∧ t[B] = 20 }** is A. $\sigma_{(A=10 \vee B=20)}(r)$ B. $\sigma_{(A=10)}(r) \cup \sigma_{(B=20)}(r)$ C. $\sigma_{(A=10)}(r) \cap \sigma_{(B=20)}(r)$ D. $\sigma_{(A=10)}(r) - \sigma_{(B=20)}(r)$
18	Given two union compatible relations $R_1(A,B)$ and $R_2(C,D)$. What is the result of the operation $R_1 \bowtie_{A=C \wedge B=D} R_2$ A. $R_1 \cup R_2$ B. $R_1 \times R_2$

C. $R_1 - R_2$
D. $R_1 \cap R_2$

19 Consider the following tables T1 and T2:

T1

P	Q
2	2
3	8
7	3
5	8
6	9
8	5
9	8

T2

R	S
2	2
8	3
3	2
9	7
5	7
7	2

In table T1, P is the primary key, Q is the foreign key referencing R in table T2 with on-delete cascade and on-update cascade. In table T2, R is the primary key and S is the foreign key referencing P in the table T1 with on-delete set NULL and on-update cascade. In order to delete record (3,8) from table, numbers of additional record that need to be deleted from table T1 is _____.

(A) 0

(B) 1

(C) 2

(D) 3

20 Consider the relations r(A, B) and s(B, C), where s.B is a primary key and r.B is a foreign key referencing s.B. Consider the query

Q: $r \bowtie (\sigma_{B<5}(s))$

Let LOJ denote the natural left outer-join operation. Assume that r and s contain no null values. Which one of the following is NOT equivalent to Q?

(A) $\sigma_{B<5}(r \bowtie s)$

(B) $\sigma_{B<5}(r \text{ LOJ } s)$

(C) $r \text{ LOJ } (\sigma_{B<5}(s))$

(D) $\sigma_{B<5}(r) \text{LOJ } s$

21 Match the following with respect to RDBMS

(a)	Entity integrity	(i)	enforces some specific business rule that do not fall into entity or domain
(b)	Domain integrity	(ii)	Rows can't be deleted which are used by other records
(c)	Referential integrity	(iii)	enforces valid entries for a column
(d)	Userdefined integrity	(iv)	No duplicate rows in a table

Code :

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iv)	(ii)	(iii)	(i)
(4)	(ii)	(iii)	(iv)	(i)

(A) (1)

(B) (2)

(C) (3)

(D) (4)

22 Consider the following schema :
Sailors (sid, sname, rating, age)

Boats (bid, bname, colour)

Reserves (sid, bid, day)

Two boats can have the same name but the colour differentiates them. The two relations
ρ (Tempsids, ($\pi_{sid, bid}$ Reserves)/(π_{bid} ($\sigma_{bname='Ganga'}$ Boats))),
π_{sname} (Tempsids ⋈ Sailors)
If / is division operation, the above set of relations represents the query

(A) Names of sailors who have reserved all boats called *Ganga*

(B) Names of sailors who have not reserved any *Ganga*boat

(C) Names of sailors who have reserved at least one *Ganga*boat

(D) Names of sailors who have reserved at most one *Ganga* boat

23 Let R(a, b, c) and S(d, e, f) be two relations in which d is the foreign key of S that refers to the primary key of R. Consider the following four operations R and S.

	I. Insert into R II. Insert into S III. Delete from R IV. Delete from S Which of the following can cause violation of the referential integrity constraint above? (A) Both I and IV (B) Both II and III (C) All of these (D) None of these
24	Given the relations employee (name, salary, dept-no), and department (dept-no, dept-name,address) Which of the following queries cannot be expressed using the basic relational algebra operations (σ, π, x, -, ∪, p) (A) Department address of every employee (B) Employees whose name is the same as their department name (C) The sum of all employees' salaries (D) All employees of a given department
25	If D_1, D_2...D_n are domains in a relational model, then the relation is a table, which is a subset of (A) $D_1 \oplus D_2 \oplus ... \oplus D_n$ (B) $D_1 x D_2 x ... x D_n$ (C) $D_1 \cup D_2 \cup ... \cup D_n$ (D) $D_1 \cap D_2 \cap ... \cap D_n$
26	Suppose database table $T_1(P, R)$ currently has tuples {(10, 5), (15, 8), (25, 6)} and table T_2 (A, C) currently has {(10, 6), (25, 3), (10, 5)}. Consider the following three relational algebra queries RA_1, RA_2 and RA_3: RA_1 : $T_1 \bowtie_{T1}.P = T_2.A\ T_2$ where $\bowtie$is natural join symbol RA_2 : $T_1 \bowtie_{T1}.P = T_2.A\ T_2$ where $\bowtie$ is left outer join symbol RA_3 : $T_1 \bowtie_{T1}.P = T_2.A$ and $T_1.R = T_2.CT_2$ The number of tuples in the resulting table of RA_1, RA_2 and RA_3 are given by: (A) 2, 4, 2 respectively (B) 2, 3, 2 respectively

	(C) 3, 3, 1 respectively (D) 3, 4, 1 respectively
27	Which of the following statements are TRUE about an SQL query? P : An SQL query can contain a HAVING clause even if it does not have a GROUP BY clause Q : An SQL query can contain a HAVING clause only if it has a GROUP BY clause R : All attributes used in the GROUP BY clause must appear in the SELECT clause S : Not all attributes used in the GROUP BY clause need to appear in the SELECT clause (A) P and R (B) P and S (C) Q and R (D) Q and S
28	**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 Phone Area** ----------

	10 2200 02 99 2100 01 Consider the above tables A, B and C. How many tuples does the result of the following SQL query contains? SELECT A.id FROM A WHERE A.age > ALL (SELECT B.age FROM B WHERE B. name = "arun") (A) 4 (B) 3 (C) 0 (D) 1
29	Database table by name Loan_Records is given below. **Borrower Bank_Manager Loan_Amount** Ramesh Sunderajan 10000.00 Suresh Ramgopal 5000.00 Mahesh Sunderajan 7000.00 What is the output of the following SQL query? SELECT Count(*) FROM ((SELECT Borrower, Bank_Manager FROM Loan_Records) AS S NATURAL JOIN (SELECT Bank_Manager, Loan_Amount FROM Loan_Records) AS T); (A) 3 (B) 9 (C) 5

	(D) 6
30	A relational schema for a train reservation database is given below. Passenger (pid, pname, age) Reservation (pid, class, tid) **Table: Passenger** **pid pname age** ---------- 0 Sachin 65 1 Rahul 66 2 Sourav 67 3 Anil 69 **Table : Reservation** **pid class tid** ---------- 0 AC 8200 1 AC 8201 2 SC 8201 5 AC 8203 1 SC 8204 3 AC 8202 What pids are returned by the following SQL query for the above instance of the tables? SELECT pid FROM Reservation , WHERE class 'AC' AND EXISTS (SELECT * FROM Passenger WHERE age > 65 AND Passenger. pid = Reservation.pid) (A) 1, 0 (B) 1, 2 (C) 1, 3 (D) 1, 5
31	Let R and S be relational schemes such that R={a,b,c} and S={c}. Now consider the following queries on the database:

	I. $\pi_{R-S}(r) - \pi_{R-S}\left(\pi_{R-S}(r) \times s - \pi_{R-S,S}(r)\right)$ II. $\left\{t \mid t \in \pi_{R-S}(r) \wedge \forall u \in s\left(\exists v \in r\left(u = v[s] \wedge t = v[R-S]\right)\right)\right\}$ III. $\left\{t \mid t \in \pi_{R-S}(r) \wedge \forall v \in r\left(\exists u \in s\left(u = v[s] \wedge t = v[R-S]\right)\right)\right\}$ IV. SELECT R.a, R.b FROM R,S WHERE R.c=S.c Which of the above queries are equivalent? (A) I and II (B) I and III (C) II and IV (D) III and IV
32	Consider the following relational schema: **Suppliers(sid:integer, sname:string, city:string, street:string)** **Parts(pid:integer, pname:string, color:string)** **Catalog(sid:integer, pid:integer, cost:real)** Consider the following relational query on the above database: SELECT S.sname FROM Suppliers S WHERE S.sid NOT IN (SELECT C.sid FROM Catalog C WHERE C.pid NOT IN (SELECT P.pid FROM Parts P WHERE P.color<> 'blue')) Assume that relations corresponding to the above schema are not empty. Which one of the following is the correct interpretation of the above query?

	(A) Find the names of all suppliers who have supplied a non-blue part. (B) Find the names of all suppliers who have not supplied a non-blue part. (C) Find the names of all suppliers who have supplied only blue parts. (D) Find the names of all suppliers who have not supplied only blue parts. (E) None
33	Consider the table employee(empId, name, department, salary) and the two queries Q1 ,Q2 below. Assuming that department 5 has more than one employee, and we want to find the employees who get higher salary than anyone in the department 5, which one of the statements is TRUE for any arbitrary employee table? Q1 : Select e.empId From employee e Where not exists (Select * From employee s where s.department = "5" and s.salary >=e.salary) Q2 : Select e.empId From employee e Where e.salary > Any (Select distinct salary From employee s Where s.department = "5") (A) Q1 is the correct query (B) Q2 is the correct query (C) Both Q1 and Q2 produce the same answer. (D) Neither Q1 nor Q2 is the correct query
34	Given the following statements: S1: A foreign key declaration can always be replaced by an equivalent check assertion in SQL. S2: Given the table R(a,b,c) where a and b together form the primary key, the following is

	a valid table definition. CREATE TABLE S (a INTEGER, d INTEGER, e INTEGER, PRIMARY KEY (d), FOREIGN KEY (a) references R) Which one of the following statements is CORRECT? (A) S1 is TRUE and S2 is FALSE. (B) Both S1 and S2 are TRUE. (C) S1 is FALSE and S2 is TRUE. (D) Both S1 and S2 are FALSE.
35	Given the following schema: employees(emp-id, first-name, last-name, hire-date, dept-id, salary) departments(dept-id, dept-name, manager-id, location-id) You want to display the last names and hire dates of all latest hires in their respective departments in the location ID 1700. You issue the following query: SELECT last-name, hire-date FROM employees WHERE (dept-id, hire-date) IN (SELECT dept-id, MAX(hire-date) FROM employees JOIN departments USING(dept-id) WHERE location-id = 1700 GROUP BY dept-id); What is the outcome? (A) It executes but does not give the correct result. (B) It executes and gives the correct result.

	(C) It generates an error because of pairwise comparison. (D) It generates an error because the GROUP BY clause cannot be used with table joins in a subquery
36	SQL allows tuples in relations, and correspondingly defines the multiplicity of tuples in the result of joins. Which one of the following queries always gives the same answer as the nested query shown below: **select * from R where a in (select S.a from S)** (A) select R.* from R, S where R.a=S.a (D) (B) select distinct R.* from R,S where R.a=S.a (C) select R.* from R,(select distinct a from S) as S1 where R.a=S1.a (D) select R.* from R,S where R.a=S.a and is unique R
37	Consider the following relational schema: employee(empId, empName, empDept) customer(custId, custName, salesRepId, rating) salesRepId is a foreign key referring to empId of the employee relation. Assume that each employee makes a sale to at least one customer. What does the following query return? SELECT empName FROM employee E WHERE NOT EXISTS (SELECT custId FROM customer C WHERE C.salesRepId = E.empId AND C.rating <> `GOOD`); (A) Names of all the employees with at least one of their customers having a 'GOOD' rating. (B) Names of all the employees with at most one of their customers having a 'GOOD' rating. (C) Names of all the employees with none of their customers having a 'GOOD' rating.

	(D) Names of all the employees with all their customers having a 'GOOD' rating.
38	Consider the relation "enrolled(student, course)" in which (student, course) is the primary key, and the relation "paid(student, amount)" where student is the primary key. Assume no null values and no foreign keys or integrity constraints. Given the following four queries: Query1: select student from enrolled where student in (select student from paid) Query2: select student from paid where student in (select student from enrolled) Query3: select E.student from enrolled E, paid P where E.student = P.student Query4: select student from paid where exists (select * from enrolled where enrolled.student = paid.student) Which one of the following statements is correct? (A) All queries return identical row sets for any database (B) Query2 and Query4 return identical row sets for all databases but there exist databases for which Query1 and Query2 return different row sets. (C) There exist databases for which Query3 returns strictly fewer rows than Query2 (D) There exist databases for which Query4 will encounter an integrity violation at runtime.
39	The following table has two attributes A and C where A is the primary key and C is the foreign key referencing A with on-delete cascade. A C ----- 2 4 3 4 4 3 5 2

	7 2 9 5 6 4 The set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted is: (A) (3,4) and (6,4) (B) (5,2) and (7,2) (C) (5,2), (7,2) and (9,5) (D) (3,4), (4,3) and (6,4)
40	The relation book (<u>title</u>, price) contains the titles and prices of different books. Assuming that no two books have the same price, what does the following SQL query list? select title from book as B where (select count(*) from book as T where T.price > B.price) < 5 (A) Titles of the four most expensive books (B) Title of the fifth most inexpensive book (C) Title of the fifth most expensive book Titles of the five most expensive books (D) Titles of the five most expensive books

Answer

1-B	2-B	3-C	4-A	5-A	6-A	7- A	8-D	9-B	10-A
11-B	12-A	13-D	14-B	15-D	16-B	17-C	18-D	19-A	20-C
21-B	22-A	23-B	24-C	25-B	26-D	27-B	28-B	29-C	30-C
31-A	32-D	33-A	34-D	35-B	36-C	37-D	38-B	39-C	40-D