



**KIIT Deemed to be University**  
**Online End Semester Examination(Autumn Semester-2021)**

**Subject Name & Code:** Database Management Systems (CS 2004)

**Applicable to Courses:** B.Tech (CSCE)

**Full Marks=50**

**Time:2 Hours**

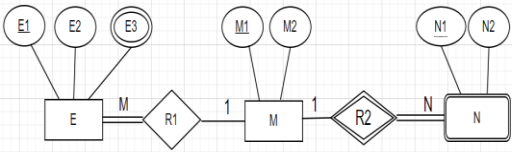
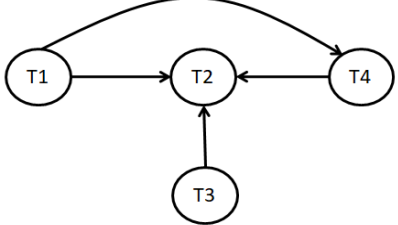
**SECTION-A(Answer All Questions. Each question carries 2 Marks)**

**Time:30 Minutes**

**(7×2=14 Marks)**

<u>Question No</u>	<u>Question Type (MCQ/SAT)</u>	<u>Question</u>	<u>CO Mapping</u>	<u>Answer Key (For MCQ Questions only)</u>																
<u>Q.No:1</u>	MCQ	<p>Which one correct?</p> <p>a) Primary Key <math>\subset</math> Super Key <math>\subset</math> Candidate Key</p> <p>b) Primary Key <math>\subset</math> Candidate Key <math>\subset</math> Super Key</p> <p>c) Candidate Key <math>\subset</math> Primary Key <math>\subset</math> Super Key</p> <p>d) Super Key <math>\subset</math> Candidate Key <math>\subset</math> Primary Key</p>	CO4	B																
	MCQ	<p>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.</p> <table><tr><th>A</th><th>C</th></tr><tr><td>2</td><td>4</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>3</td></tr><tr><td>5</td><td>2</td></tr><tr><td>7</td><td>2</td></tr><tr><td>9</td><td>5</td></tr><tr><td>6</td><td>4</td></tr></table> <p>What is the set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted?</p> <p>a) (5,2) (7,2)</p> <p>b) (4,3)</p>	A	C	2	4	3	4	4	3	5	2	7	2	9	5	6	4	CO3	A
A	C																			
2	4																			
3	4																			
4	3																			
5	2																			
7	2																			
9	5																			
6	4																			

		c) (3,4) (6,4) d) None of these is correct														
	MCQ	Let R (A, B, C) be a relation as follows: <table border="1"> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td>10</td> <td>20</td> <td>30</td> </tr> <tr> <td>70</td> <td>20</td> <td>30</td> </tr> <tr> <td>10</td> <td>20</td> <td>50</td> </tr> </table> What is the correct output of the following SQL query?  SELECT COUNT(*) FROM (SELECT r1.A, r1.B, r1.C FROM R r1, R r2 WHERE r1.B = r2.B AND r1.C = r2.C);  (a) 8 (b) 7 (c) 6 (d) 5	A	B	C	10	20	30	70	20	30	10	20	50	CO3	D
A	B	C														
10	20	30														
70	20	30														
10	20	50														
	MCQ	'___ %' matched any string of  a) At least three characters b) At most three characters c) Exactly three characters d) Exactly three characters ending with %	CO3	A												
<b>Q.No:2</b>	MCQ	Consider the ER diagram as follows:   How many foreign keys can be created while mapping to tables from the given ER Model? (a) 3 (b) 4 (c) 5 (d) 6	CO2	B												
	MCQ	Consider the ER diagram as follows:   How tables can be created in this example?  (a) 2 (b) 3 (c) 4 (d) 5	CO2	C												

	MCQ	<p>Let E1 and E2 be two entities in an ER diagram with simple single valued attributes (with one of the attribute serve as a primary key). 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 and foreign keys are required to represent this situation in relational model?</p> <p>a) (2, 2) b) (2, 3) c) (3, 2) d) (3, 3)</p>	CO2	D
	MCQ	 <p>Which of the following is a correct attribute set of one of the tables for the correct answer to the above question? [Here, N is a weak entity set].</p> <p>a) {E1, E2, E3} b) {E1, E2, M1} c) {M1, M2, E1} d) {N1, N2, M1, M2}</p>	Co2	B
<b>Q.No:3</b>	MCQ	 <p>Consider the above precedence graph of concurrent execution of four transactions, which is conflict serializable. Which of the following is the correct corresponding serial schedule of the above graph?</p> <p>a) {T1→T4→T2→T3} b) {T3→T2→T1→T4} c) {T3→T1→T4→T2} d) {T2→T1→T3→T4}</p>	CO5	C
		<p>Consider the following concurrent schedule: S : R1(A) , R2(A) , R2(B) , R3(B) , W1(A) , W2(B).</p> <p>The above schedule is</p> <p>I. Conflict serializable schedule. II. Not conflict serializable schedule. III. Conflict equivalent to {T1→T2→T3} IV. Conflict equivalent to</p>		

	MCQ	<p>{T3→T2→T1}</p> <p>Which of the following is true?</p> <p>a) Only I</p> <p>b) Only II</p> <p>c) I and III</p> <p>d) I and IV</p>	CO5	D																		
	MCQ	<p>The Timestamp Ordering Protocol is used to order the transactions based on their Timestamps. Let the TS(T1) = 3 and TS(T2) =4. Then, which among the following is incorrect about Timestamp Ordering Protocol.</p> <p>I. The transaction T1 issuing a Read (X) operation will be rejected if TS(T1) &lt; W_TS (X).</p> <p>II. This protocol is free from deadlock thus no transaction ever waits.</p> <p>III. The transaction T1 issuing Write(X) operation will be executed if TS(T1) &lt; R_TS(X).</p> <p>a) Only I</p> <p>b) Only II</p> <p>c) Only III</p> <p>d) Both I and III</p>	CO5	C																		
	MCQ	<p>Consider the following schedule with locking:</p> <table border="1"> <thead> <tr> <th>T1</th> <th>T2</th> </tr> </thead> <tbody> <tr> <td>Lock-X(A)</td> <td></td> </tr> <tr> <td>R(A)</td> <td></td> </tr> <tr> <td>W(A)</td> <td></td> </tr> <tr> <td></td> <td>Lock-X(B)</td> </tr> <tr> <td></td> <td>R(B)</td> </tr> <tr> <td></td> <td>W(B)</td> </tr> <tr> <td></td> <td>Lock-X(A)</td> </tr> <tr> <td>Lock-X(B)</td> <td></td> </tr> </tbody> </table> <p>Which of the following is true?</p> <p>a) Schedule is in dead-lock state.</p> <p>b) Schedule is conflict serializable</p> <p>c) Schedule is not conflict serializable</p> <p>d) Both a &amp; b</p>	T1	T2	Lock-X(A)		R(A)		W(A)			Lock-X(B)		R(B)		W(B)		Lock-X(A)	Lock-X(B)		CO5	D
T1	T2																					
Lock-X(A)																						
R(A)																						
W(A)																						
	Lock-X(B)																					
	R(B)																					
	W(B)																					
	Lock-X(A)																					
Lock-X(B)																						
<b>Q.No:4</b>	MCQ	<p>Let R = (A, B, C, D) be a relations schema with A, B, C, D are the candidate keys. The number of super keys formed are:</p> <p>a) 4</p> <p>b) 7</p> <p>c) 15</p> <p>d) 16</p>	CO5	C																		

	MCQ	Let R = (A, B, C, D, E) be a relation schema with {AB} is the <b>only candidate keys</b> . The maximum number of super keys formed are:  (a) 3 (b) 4 (c) 5 (d) 8	CO4	D									
	MCQ	Consider the following set of functional dependencies, F = {A→B, A→C, A→D, B→C, B→E, C→E} defined on a relation schema R (A, B, C, D, E). Which of the following is the set of redundant functional dependencies?  (a) A→B & A→C (b) A→C & B→E (c) A→B & B→C (d) B→C & C→E	CO4	B									
	MCQ	Let R(A,B,C,D,E) be a relation schema with set of functional dependencies, F = {AB→CDE, B→D, C→E}. The relation R is decomposed into R1(B,D), R2(C,E) and R3(ABC). Which of the following is true for the above problem description? I. R is in 1NF. II. The decomposition is lossless join and dependency preserving decomposition. III. The decomposition is lossless join and but not a dependency preserving decomposition. IV. R1, R2, R3 are in BCNF  (a) Only I is true (b) Both I & II are true (c) Both I & III are true (d) Only IV is true	CO4	B									
<b>Q.No:5</b>	MCQ	Consider the following two tables: LOAN <table border="1"><tr><th>LoanNo</th><th>BranchName</th><th>Amount</th></tr><tr><td>L1001</td><td>KIIT</td><td>35000</td></tr><tr><td>L1002</td><td>IIT</td><td>42000</td></tr></table> BORROWER	LoanNo	BranchName	Amount	L1001	KIIT	35000	L1002	IIT	42000	CO3	C
LoanNo	BranchName	Amount											
L1001	KIIT	35000											
L1002	IIT	42000											

		<table><tr><td>CustmerNo</td><td>LoanNo</td></tr><tr><td>C1001</td><td>L1001</td></tr><tr><td>C1002</td><td>L1002</td></tr><tr><td>C1003</td><td>L1002</td></tr></table> <p>SELECT * FROM LOAN, BORROWER;</p> <p>How many tuples will be resulted by the above query?</p> <p>(a) 4 (b) 5 (c) 6 (d) 7</p>	CustmerNo	LoanNo	C1001	L1001	C1002	L1002	C1003	L1002																						
CustmerNo	LoanNo																															
C1001	L1001																															
C1002	L1002																															
C1003	L1002																															
	MCQ	<p>Consider the following Employee table:</p> <table><tr><td>EmpName</td><td>BranchName</td><td>BranchCity</td><td>Salary</td></tr><tr><td>A</td><td>DU</td><td>DELHI</td><td>50000</td></tr><tr><td>B</td><td>DU</td><td>DELHI</td><td>55000</td></tr><tr><td>C</td><td>JNU</td><td>DELHI</td><td>60000</td></tr><tr><td>D</td><td>JU</td><td>KOLKOTA</td><td>65000</td></tr><tr><td>E</td><td>CU</td><td>KOLKOTA</td><td>70000</td></tr><tr><td>F</td><td>UU</td><td>BBSR</td><td>75000</td></tr></table> <p>Find the distinct number of branches appearing in the Employee table.</p> <p>(a) select count (BranchName) from Employee;</p> <p>(b) select count (distinct (BranchName) from Employee;</p> <p>(c) select distinct count (BranchName) from Employee;</p> <p>(d) select count (*) from Employee;</p>	EmpName	BranchName	BranchCity	Salary	A	DU	DELHI	50000	B	DU	DELHI	55000	C	JNU	DELHI	60000	D	JU	KOLKOTA	65000	E	CU	KOLKOTA	70000	F	UU	BBSR	75000	CO3	B
EmpName	BranchName	BranchCity	Salary																													
A	DU	DELHI	50000																													
B	DU	DELHI	55000																													
C	JNU	DELHI	60000																													
D	JU	KOLKOTA	65000																													
E	CU	KOLKOTA	70000																													
F	UU	BBSR	75000																													
	MCQ	<p>Consider the following Employee table:</p> <table><tr><td>EmpName</td><td>BranchName</td><td>BranchCity</td><td>Salary</td></tr><tr><td>A</td><td>DU</td><td>DELHI</td><td>50000</td></tr><tr><td>B</td><td>DU</td><td>DELHI</td><td>55000</td></tr><tr><td>C</td><td>JNU</td><td>DELHI</td><td>60000</td></tr><tr><td>D</td><td>JU</td><td>KOLKOTA</td><td>65000</td></tr><tr><td>E</td><td>CU</td><td>KOLKOTA</td><td>70000</td></tr><tr><td>F</td><td>UU</td><td>BBSR</td><td>75000</td></tr></table> <p>Find the total salary of all employees at each branch of the bank?</p> <p>a) select BranchName, SUM(Salary) from Employee GROUP BY BranchCity;</p> <p>b) select BranchName, SUM(Salary) from Employee GROUP BY BranchName;</p> <p>c) select TOTAL(Salary) from Employee GROUP BY BranchName;</p> <p>d) select BranchName, SUM(Salary)</p>	EmpName	BranchName	BranchCity	Salary	A	DU	DELHI	50000	B	DU	DELHI	55000	C	JNU	DELHI	60000	D	JU	KOLKOTA	65000	E	CU	KOLKOTA	70000	F	UU	BBSR	75000	CO3	B
EmpName	BranchName	BranchCity	Salary																													
A	DU	DELHI	50000																													
B	DU	DELHI	55000																													
C	JNU	DELHI	60000																													
D	JU	KOLKOTA	65000																													
E	CU	KOLKOTA	70000																													
F	UU	BBSR	75000																													

		from Employee;																														
	MCQ	<p>Consider the following Employee table:</p> <table><tr><td>EmpName</td><td>BranchName</td><td>BranchCity</td><td>Salary</td></tr><tr><td>A</td><td>DU</td><td>DELHI</td><td>50000</td></tr><tr><td>B</td><td>DU</td><td>DELHI</td><td>55000</td></tr><tr><td>C</td><td>JNU</td><td>DELHI</td><td>60000</td></tr><tr><td>D</td><td>JU</td><td>KOLKOTA</td><td>65000</td></tr><tr><td>E</td><td>CU</td><td>KOLKOTA</td><td>70000</td></tr><tr><td>F</td><td>UU</td><td>BBSR</td><td>75000</td></tr></table> <p>Which of the following SQL statement will display all the employee records, whose salary is equal to the branch city wise average salary?</p> <p>a) select * from Employee where Salary in (select avg (Salary) from Employee group by Branchcity);</p> <p>b) select * from Employee where Salary = (select avg (Salary) from Employee group by Branchcity);</p> <p>c) select * from Employee where Salary is equal to (select avg (Salary) from Employee group by Branchcity);</p> <p>d) select avg (Salary) from Employee group by Branchcity;</p>	EmpName	BranchName	BranchCity	Salary	A	DU	DELHI	50000	B	DU	DELHI	55000	C	JNU	DELHI	60000	D	JU	KOLKOTA	65000	E	CU	KOLKOTA	70000	F	UU	BBSR	75000	CO3	A
EmpName	BranchName	BranchCity	Salary																													
A	DU	DELHI	50000																													
B	DU	DELHI	55000																													
C	JNU	DELHI	60000																													
D	JU	KOLKOTA	65000																													
E	CU	KOLKOTA	70000																													
F	UU	BBSR	75000																													
<b>Q.No:6</b>	MCQ	<p>I. The secondary index may be on a field which is a candidate key and has a unique value in every record, or a non-key with duplicate values.</p> <p>II. The secondary index is always based on a field which is a candidate key only.</p> <p>III. A secondary index provides a secondary means of accessing a file for which some primary access already exists</p> <p>Answer the following</p> <p>a) Statement I and II are true.</p> <p>b) Statement II and III are true.</p> <p>c) Statements I and III are true.</p> <p>d) All statements are true</p>	CO6	C																												
	MCQ	<p>Suppose we have an ordered file with 45,000 records stored on a disk with block size 2048 byte. File records are of fixed size with record length 120 bytes.</p> <p>What is the blocking factor?</p> <p>a) 17</p> <p>b) 18</p> <p>c) 21</p> <p>d) 22</p>	CO6	A																												
		In case of Log-Based Recovery of deferred database modification scheme, what																														

		<p>action(s) to be taken after recovery of the system of the following schedule consist of two transactions T<sub>0</sub> and T<sub>1</sub>?</p> <table> <tr><td>&lt;T<sub>0</sub>, start&gt;</td></tr> <tr><td>&lt;T<sub>0</sub>, A, 1000, 900&gt;</td></tr> <tr><td>&lt;T<sub>0</sub>, B, 2000, 2100&gt;</td></tr> <tr><td>&lt;T<sub>0</sub>, commit&gt;</td></tr> <tr><td>&lt;T<sub>1</sub>, start&gt;</td></tr> <tr><td>&lt;T<sub>1</sub>, C, 750, 700&gt;</td></tr> <tr><td>FAILURE</td></tr> </table> <p>a) Redo-T<sub>0</sub> and No action for T<sub>1</sub>  b) Redo-T<sub>0</sub> and Redo-T<sub>1</sub>  c) Redo-T<sub>0</sub> and Undo T<sub>1</sub>  d) No action for T<sub>0</sub> and T<sub>1</sub></p>	<T <sub>0</sub> , start>	<T <sub>0</sub> , A, 1000, 900>	<T <sub>0</sub> , B, 2000, 2100>	<T <sub>0</sub> , commit>	<T <sub>1</sub> , start>	<T <sub>1</sub> , C, 750, 700>	FAILURE	CO6	A
<T <sub>0</sub> , start>											
<T <sub>0</sub> , A, 1000, 900>											
<T <sub>0</sub> , B, 2000, 2100>											
<T <sub>0</sub> , commit>											
<T <sub>1</sub> , start>											
<T <sub>1</sub> , C, 750, 700>											
FAILURE											
	MCQ	<p>Which statement(s) is/are true with respect to two-phase locking protocol?</p> <p>I. Two transactions cannot have conflicting locks.  II. No unlock operation can precede a lock operation in the same transaction.  III. No data is/are affected until all locks are obtained and until the transaction is in its locked point.</p> <p>a) Only I  b) Only II  c) Both I &amp; II  d) All I, II, III</p>	CO5	D							
<b>Q.No:7</b>	MCQ	<p>'Failures may leave database in an inconsistent state with partial updates carried out' is the case of</p> <p>a) Integrity problem  b) Atomicity problem  c) Security problem  a) Data Redundancy &amp; Inconsistency</p>	CO1	B							
	MCQ	<p>Which statement(s) is/are not correct with respect to a database system requirement?</p> <p>I. High availability  II. High response time  III. High throughput</p> <p>a) Only I  b) Only II  c) Only III  d) All are correct</p>	CO5	B							
	MCQ	<p>Which of the following is used to provide faster access to data items stored in physical storage?</p> <p>a) Date files  b) Indices</p>									



		c) Data dictionary d) Buffer manager	CO2	B
	MCQ	Consider a schema R(A, B, C, D) with set of functional dependencies, $F=\{A \rightarrow B, C \rightarrow D\}$ . Then the decomposition of R into R1 (A, B) and R2(C, D) is: a) dependency preserving and lossless join b) lossless join but not dependency preserving c) dependency preserving but not lossless join d) not dependency preserving and not lossless join	CO6	C

**SECTION-B(Answer Any Three Questions. Each Question carries 12 Marks)**

**Time: 1 Hour and 30 Minutes**

**(3×12=36 Marks)**

<b><u>Question No</u></b>	<b><u>Question</u></b>	<b><u>CO Mapping (Each question should be from the same CO(s))</u></b>
<b><u>Q.No:8</u></b>	<p><b>Consider the following problem description of a University:</b>  A University has a number of Departments (identified by DeptID with other attributes as DeptName and Location). Each department offers a number of courses (identified by CourseID with other attributes as CourseName, Credit, CourseType) and a course cannot be offered by more than one department. Each department has a number of faculty members (identified by facultyID, with other attributes as FacultyName and Specialization) who works for that department but a faculty cannot work in more than one department. Students (identified by RollNo with other attributes as StudName, Address) register for courses and a course can also be registered by more than one student. Each course is either a Core Course or a Department Elective or an Open Elective course and this can be defined by an attribute called CourseType. A faculty can teach one or more than one course and a course can be taught by more than one</p>	

	<p>faculty. Every course must have a course coordinator, who is in fact a faculty and a faculty can be the course coordinator of at most one course.</p> <p>a) Draw the ER/ Extended ER diagram of the above problem description. The given name of entities and attributes should be the same in the ER diagram. (Mention clearly all assumptions made by you in imposing constraints. <b>(8 marks)</b>)</p>	CO2
	<p>b) Map the ER diagram into relations and specify the Primary keys and Foreign keys of each relation. The foreign keys must refer to the primary key using an arrow. <b>(4 marks)</b></p>	
<b><u>Q. No. 8</u></b>	<p><b>Consider the following problem description:</b>  The publishing company (identified by PublisherName with other attributes as Location) produces books on various subjects (identified by subjectID with SubjectName as another attribute). Each publishing company is located in various locations. The books (identified by BookId) are written by authors (identified by AuthorID with AuthorName as another attribute) who specialize in one particular subject. The company employs editors (identified by EditorID with EditorName as another attribute) who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more book publications.  Shop owners (identified by ShopID, with ShopName as another attribute) buy books from the publisher. Shop owners can buy many books but one book can be brought by one shop owner only.</p> <p>a) Draw the ER diagram of the above problem description. The given name of entities and attributes should be same in the ER diagram. (Mention clearly all assumptions made by you in imposing constraints. <b>(8 marks)</b>)</p> <p>b) Map the ER diagram into relations and specify the Primary keys and Foreign keys of each relation. The foreign keys must refer to the primary key using an arrow. <b>(4 marks)</b></p>	CO2
<b><u>Q. No. 8</u></b>	<p><b>Consider the following problem description:</b>  An educational institute database needs to store information about employees (identified by empId, with empName, and address as attributes); departments (identified by deptId, with deptName and location as attributes); projects (identified by projId, with projName, budget as attributes) and children of employees (with name and age as attributes). A department can have many employees and an employee can work in only one department. Employees can works on different projects. A department can have many projects and a project can belongs to only one department. Each project is sponsored by one sponsoring agency (identified by agencyID with agencyName and type as attributes). The sponsoring agency can be either a Government Agency or a Company agency, whose information the Institute is interested to keep. The sponsoring agencies are</p>	CO2

	<p>classified by the attribute 'Type'. Each department is managed by an employee. A department can be located in many places. A child must be identified uniquely by name when the parent (who is an employee; assume that only one parent works for the institute) is known. We are not interested in information about a child once the parent leaves the institute.</p> <p>a) Draw the ER diagram of the above problem description. The given name of entities and attributes should be same in the ER diagram. (Mention clearly all assumptions made by you in imposing constraints. <b>(8 marks)</b>)</p> <p>b) Map the ER diagram into relations and specify the Primary keys and Foreign keys of each relation. The foreign keys must refer to the primary key using an arrow. <b>(4 marks)</b></p>	
<b><u>Q.No:9</u></b>	<p>i) Given relation schema, R (A, B, C, D) and set of functional dependencies, <math>F = \{B \rightarrow A, AD \rightarrow BC, C \rightarrow ABD\}</math>. <b>[3+1+2+2=8 marks]</b></p> <p>a) Compute the minimal cover for F.</p> <p>b) Find all candidate keys.</p> <p>c) Is the R in BCNF? If not, can we do BCNF decomposition? Justify.</p> <p>d) Is the R in 3NF?</p> <p>ii) State and prove Armstrong's Union and Decomposition rules using Armstrong's 3 axioms. <b>[4marks]</b></p>	CO4
<b><u>Q.No:9</u></b>	<p>i) Let R (A,B,C,D,E,F) be relation schema with a set of functional dependencies, <math>G = \{A \rightarrow B, C \rightarrow DF, AC \rightarrow E\}</math>. <b>[2+2+4=8 marks]</b></p> <p>a) Find the candidate key(s)</p> <p>b) Do the BCNF decomposition.</p> <p>c) Check whether the decomposition is lossless join and dependency preserving decomposition or not?</p> <p>ii) Let R (A, B, C, D, E, G, H) be a relation schema with set of functional dependencies, <math>F = \{A \rightarrow B, B \rightarrow A, C \rightarrow D, E \rightarrow GD, C \rightarrow A, H \rightarrow CAB, EG \rightarrow CA\}</math>. Using all the required steps, find the canonical cover of F. <b>[4 marks]</b></p>	CO4
<b><u>Q.No:9</u></b>	<p>i) Find the minimal cover of the given set of functional dependencies, <math>F = \{AB \rightarrow E, C \rightarrow D, F \rightarrow GH, FG \rightarrow GH, B \rightarrow FG\}</math> using step by step process. <b>[4 marks]</b></p> <p>ii) State and prove the pseudo transitivity rule using Armstrong's axioms. <b>[2 marks]</b></p> <p>iii) Given a relation R (A, B, C, D, E) and set of functional dependencies, <math>F = \{A \rightarrow B, B \rightarrow E, C \rightarrow D\}</math> <b>[1+5= 6 Marks]</b></p> <p>a) Find the candidate key.</p> <p>b) Is R in 3NF? If not, then convert it into 3NF and check for the lossless join property of the decomposition.</p>	CO4

<b>Q.No:10</b>	<p>Consider the following concurrent schedule consists of transactions T1 and T2:</p> <table><tr><td><i>T1</i></td><td><i>T2</i></td></tr><tr><td><i>Read(X)</i></td><td></td></tr><tr><td><i>X=X-100</i></td><td></td></tr><tr><td></td><td><i>Read(X)</i></td></tr><tr><td></td><td><i>X= X+150</i></td></tr><tr><td><i>Write (X)</i></td><td></td></tr><tr><td><i>Read(Y)</i></td><td></td></tr><tr><td></td><td><i>Write(X)</i></td></tr><tr><td><i>Y=Y+100</i></td><td></td></tr><tr><td><i>Write(Y)</i></td><td></td></tr></table> <p>The initial values of X and Y are 1000 and 2000 respectively. <b>[2+2+4+4=12 marks]</b></p> <ul style="list-style-type: none"><li>a) Find the final values of X and Y. (mention outputs in a step by step manner, using above diagram)</li><li>b) If the transactions are executed in serial manner &lt;T1,T2&gt;, then what would be the values of X and Y at the end of the given serial execution? (mention the outputs in a step by step manner, by drawing the serial schedule &lt;T1,T2&gt; diagram) [2 marks]</li><li>c) Is the given concurrent schedule is conflict serializable? Test using precedence graph.</li><li>d) What would be the scenario, if data-locks (shared and exclusive) are given to data items in the given concurrent schedule? Answer by drawing the updated schedule with all locks.</li></ul>	<i>T1</i>	<i>T2</i>	<i>Read(X)</i>		<i>X=X-100</i>			<i>Read(X)</i>		<i>X= X+150</i>	<i>Write (X)</i>		<i>Read(Y)</i>			<i>Write(X)</i>	<i>Y=Y+100</i>		<i>Write(Y)</i>		CO5
<i>T1</i>	<i>T2</i>																					
<i>Read(X)</i>																						
<i>X=X-100</i>																						
	<i>Read(X)</i>																					
	<i>X= X+150</i>																					
<i>Write (X)</i>																						
<i>Read(Y)</i>																						
	<i>Write(X)</i>																					
<i>Y=Y+100</i>																						
<i>Write(Y)</i>																						
<b>Q.No:10</b>	<ul style="list-style-type: none"><li>i) Consider the two transactions (T1 &amp; T2) on a bank account, 'B', with initial balance Rs. 15000/-, that transfer Rs. 3000/- to a mortgage, 'M', payment (by T1) and then apply 5% interest to account 'B' (by T2). Initially M is empty. <b>[4+2=6 marks]</b><ul style="list-style-type: none"><li>a)Create the log sequence of the serial schedule &lt;T1, T2&gt;</li><li>b) Find the actions to be taken when the database system crashes just before the COMMIT operation (and after the last statement) of T2 with the Deferred Updates.</li></ul></li><li>ii) Consider three transactions T1, T2, T3 and schedule S1as given below. 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). <b>[4+2=6 marks]</b><ul style="list-style-type: none"><li>a)Check the conflict serializability of S1 by drawing the precedence graph.</li><li>b) If the schedule is conflict serializable, then find the</li></ul></li></ul>	CO5																				

	equivalent serial schedule.	
<b><u>Q.No:10</u></b>	<p>i) Is every view serializable schedule is conflict serializable? Explain with a suitable example. <b>[4 marks]</b></p> <p>ii) Check the view serializability of the given schedule {R1(X); W1(X); R3(X); R2(X); W3(X)} using label precedence graph. <b>[4 marks]</b></p> <p>iii) Can you apply two phase locking protocol on the given schedule {R1(X); W1(X); R3(X); R2(X); W3(X)}? Justify your answer with depicting locks in the diagram of given concurrent schedule. <b>[4 marks]</b></p>	CO5
<b><u>Q.No:11</u></b>	<p>i. Consider the following tables of a relational database system  HOTEL (<u>hotelNo</u>, hotelName, city)  ROOM ( <u>roomNo</u>, <u>hotelNo</u>, type, price)  BOOKING (<u>hotelNo</u>, <u>guestNo</u>, <u>dateFrom</u>, dateTo, roomNo)  GUEST (<u>guestNo</u>, guestName, guestAddress)  Answer the following queries using SQL: <b>[4 x 2 = 8 marks]</b></p> <p>a) Create HOTEL and ROOM tables with primary key and foreign key constraints.</p> <p>b) List name of all hotels whose room price is below Rs. 1000/- per night.</p> <p>c) Display the hotel name, guest name and guest address of all guests who have booked rooms from 6-12-2021 to 10-12-2021.</p> <p>d) Display the highest room price of the hotel named as 'Grand Hotel'.</p> <p>ii. Supported with suitable example (of your own) and schematic diagram, explain the primary index and secondary index. <b>(4 marks)</b></p>	CO4 & CO6

<b>Q.No:11</b>	<p>i. Consider the following tables of a relational database system  HOTEL (<u>hotelNo</u>, hotelName, city)  ROOM ( <u>roomNo</u>, <u>hotelNo</u>, type, price)  BOOKING (<u>hotelNo</u>, <u>guestNo</u>, <u>dateFrom</u>, dateTo, roomNo)  GUEST (<u>guestNo</u>, guestName, guestAddress)</p> <p>Answer the following queries using Relational Algebra: <b>[4 x 2 = 8 marks]</b></p> <p>a) List name of all hotels whose room price is below Rs. 1000/- per night.</p> <p>b) Display the hotel name, guest name and guest address of all guests who have booked rooms from 6-12-2021 to 10-12-2021.</p> <p>c) Display the highest room price of the hotel named as 'Grand Hotel'.</p> <p>d) Display the highest room price of all hotels without using max() function.</p> <p>iii. Construct a B+ tree of order 3, for (2, 14, 8, 32, 20, 40, 64, 82, 101, 121). Mention all steps for every insertion during the creation of the tree. <b>(4 marks)</b></p>	CO4 & CO6
<b>Q.No:11</b>	<p>i. Consider the following tables of a relational database system  HOTEL (<u>hotelNo</u>, hotelName, city)  ROOM ( <u>roomNo</u>, <u>hotelNo</u>, type, price)  BOOKING (<u>hotelNo</u>, <u>guestNo</u>, <u>dateFrom</u>, dateTo, roomNo)  GUEST (<u>guestNo</u>, guestName, guestAddress)</p> <p>Answer the following queries using tuple relational calculus: <b>[4 x 2 = 8 marks]</b></p> <p>a) Display all hotels which are located in 'Delhi'.</p> <p>b) List name of all hotels whose room price is below Rs. 1000/- per night.</p> <p>c) Display the hotel name, guest name and guest address of all guests who have booked rooms from 6-12-2021 to 10-12-2021.</p> <p>d) Display the room price of the hotel named as 'Grand Hotel'.</p> <p>ii) Construct a B+ tree of order 5, for letters (U, N, C, O, P, Y, R, I, G, H, T, A, B, L, E) Mention all steps for every insertion during the creation of the tree. <b>(4 marks)</b></p>	CO4 & CO6

CO #	Detail
CO1	Describe the fundamental elements of relational database management systems and understand the database systems and its applications.
CO2	Conceptualize and depict a database system using ER diagram.
CO3	Construct queries using relational algebra, relational calculus and SQL.
CO4	Understand the functional dependencies and design the database using normalization.
CO5	Understand the needs of Transaction processing and learn techniques for controlling the

	consequences of concurrent data access.
CO6	Understand basic database storage structures and access techniques: file organizations, indexing methods including B-tree, and hashing.