

TEMPLATE FOR QUESTION PAPER

Name of the Examination: CAT 2

School	SCOPE
Course Code	CSE2007
Semester	WIN SEM 2021- 22
Slot	B1+TB1
Duration	90 minutes
	Total Marks
	50

ANSWER ALL THE QUESTIONS

(MARKS ARE MENTIONED IN SQUARE BRACKET)

Q1.

a. Suppose in relation schema R(NAME, DOB, CITY, DEPT), has the following functional dependencies:

F={NAME → DOB,CITY;

DOB→ NAME,CITY;

{DEPT,CITY}→ DOB}

Find the candidate keys. Also, find out the super key(s) which are not candidate keys. [6.5]

b. Suppose in R(A, D, H, C, E), we have two sets of functional dependencies F1 and F2.

F1={A→C,

{A,C}→D;

E→A,D;

E→H}

F2={A→C,D;

E→H}

Check, F1 and F2 are equivalent or not? Justify. [6]

Q2.

Check which highest normal form will be satisfied by the given relation along with the provided functional dependencies (f.d.).

R(A, B, C, D, E, F, G, H, I, J) and

f.d. = {
{} → C;
{A,D} → G,H;
{B,D} → E,F;
A → I;
H → J}

Also, decompose the table into its next higher normal form. [12.5]

Q3.

Consider the following relations with their attributes:

EMPLOYEE(fname, lname, ssn, sex, salary, super_ssn, dno, city, birth_date)

DEPENDENT(ssn, dependent_name, sex, relationship, birth_date)

DEPARTMENT(Dname, Dnumber, Mgr_ssn, Mgr_start_date)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

DEPT_LOCATIONS(Dnumber, Dlocation)

ssn stands for social security number of an employee, super_ssn stands for supervisor's ssn, essn stands for employee's ssn. ssn is the primary key of EMPLOYEE relation and essn is the foreign key of DEPENDENT relation referring to the EMPLOYEE relation. Mgr_ssn is the manager ssn which is a Foreign Key(FK) in DEPARTMENT table and referring to EMPLOYEE table, Dnum is FK in PROJECT table referring to DEPARTMENT table. Pname stands for project name. Essn is FK in WORKS_ON table referencing primary key of EMPLOYEE table and Pno is also FK in WORKS_ON table referencing Pnumber in PROJECT table. Dnumber is the foreign key in DEPT_LOCATIONS referencing DEPARTMENT table. Mgr_start_year is the year when a manager started managing the corresponding department.

Write the queries in SQL to achieve the following:

- a. Find the fname and lname of all such male employees who have salary greater than all employees from department number 5. [3]
- b. Retrieve fname, lname, ssn of such employees who is working as a manager and has dependents. [3]
- c. Find social security number of the employees who have no dependents. [3]
- d. Calculate average work done by each of the employees (in hours). [3]

e. Write the syntax to create the table WORKS_ON as mentioned above. After creating the table, add another column named as JobLocation. [3]

Q4

Consider the following relations with their attributes:

PROTECT(PhoneNumber, PhoneNumber, Location, Name, LastName, Sex, Date, BirthDate, Address, Street, ZipCode, City, State, Country)

WORKS_ON(Essn, Pno, Hours)

Draw the initial query tree for the following SQL query. Then apply heuristic query optimization on that initial query tree to find the final query tree (if any) that is efficient to execute.

```
SELECT E.Fname, E.ssn, E.Sex FROM EMPLOYEE ASE, WORKS_ON AS W, PROJECT  
ASP WHERE E.Ssn = W.Essn AND W.Pno = P.Pnumber AND P.Pname = 'OnlineApp';
```

[OT]

QP Mapping



TEMPLATE FOR QUESTION PAPER

Name of the Examination: CAT 2

School	SCOPE
Course Code	CSE2007
Semester	WIN SEM 2021-22
Slot	B2+TB2
Duration	90 minutes
	Total Marks
	50

ANSWER ALL THE QUESTIONS

(MARKS ARE MENTIONED IN SQUARE BRACKET)

Q1.

a. Suppose in a relation schema R(acc, name, branch, sal, loc, ifsc) has the following functional dependencies:

$F = \{ \{ loc, ifsc \} \rightarrow acc,$
 $\{ ifsc, branch \} \rightarrow sal;$
 $name \rightarrow branch;$
 $\{ sal, loc \} \rightarrow name \}$

Find out the candidate key(s). Also, find out the super key(s) which are not candidate keys. [6.5]

b. Suppose in Stud(RegNo, Name, Dob, City), we have a set of functional dependencies

$F = \{ \{ RegNo, Name \} \rightarrow Dob,$
 $Dob \rightarrow City;$
 $City \rightarrow RegNo \}$

Check, which highest normal form is satisfied by the given table and why? [6]

Q2.

Suppose in R(A, B, C, D, E, H), we have a set of functional dependencies,
 $f.d. = \{ \{ C, D \} \rightarrow A, B,$
 $C \rightarrow D;$
 $D \rightarrow E, H;$

$\{A,E\} \rightarrow C$;
 $A \rightarrow C$;
 $B \rightarrow D$.

Find a minimal cover of the given set of f.d. [12.5]

Q3.

Consider the following relations with their attributes:

EMPLOYEE(fname, lname, ssn, sex, salary, super_ssn, dno, city, birth_date)

DEPENDENT(ssn, dependent_name, sex, relationship, birth_date)

DEPARTMENT(Dname, Dnumber, Mgr_ssn, Mgr_start_date)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

DEPT_LOCATIONS(Dnumber, Dlocation)

ssn stands for social security number of an employee, super_ssn stands for supervisor's ssn, essn stands for employee's ssn. ssn is the primary key of EMPLOYEE relation and essn is the foreign key of DEPENDENT relation referring to the EMPLOYEE relation. Mgr_ssn is manager ssn which is a Foreign Key(FK) in DEPARTMENT table and referring to EMPLOYEE table, Dnum is FK in PROJECT table referring to DEPARTMENT table. Pname stands for project name. Essn is FK in WORKS_ON table referencing primary key of EMPLOYEE table and Pno is also FK in WORKS_ON table referencing Pnumber in PROJECT table. Dnumber is the foreign key in DEPT_LOCATIONS referencing DEPARTMENT table. Mgr_start_year is the year when a manager started managing the corresponding department.

Write the queries in SQL to achieve the following:

- a. Increase the salary by 5% of every male manager. [3]
- b. Find those department number where number of employees are more than 100 and average salary is greater than 50000. [3]
- c. Delete the column birth_date from employee table. Add one column "Age" in employee. [3]
- d. Using the modified employee table, retrieve names and ssn of such male employees whose ages are between 40 to 50 and have dependents more than 2. [3]
- e. Write the SQL syntax to define table EMPLOYEE as mentioned above and impose constraint like age should be greater than 22. [3]

Q4.

Consider the following relations with their attributes:

EMPLOYEE(fname, lname, ssn, sex, salary, super_ssn, dno, address, birth_date)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

Draw the initial query tree for the following SQL query. Then apply heuristic query optimization on that initial query tree to find the final query tree (if any) that is efficient to execute.

```
SELECT E.ssn, P.Pname, E.salary FROM EMPLOYEE AS E, WORKS_ON AS W,  
PROJECT AS P WHERE E.Ssn = W.Essn AND W.Pno = P.Pnumber AND P.location =  
'Guntur' AND E.sex='Female';
```

QP Mapping

TEMPLATE FOR QUESTION PAPER

Name of the Examination: CAT 2

School	SCOPE	Course Title	DATABASE MANAGEMENT SYSTEMS
Course Code	CSE2007	Course Title	DATABASE MANAGEMENT SYSTEMS
Semester	WIN SEM 2021-22	Date of exam	21.4.2022
Slot	D2+TD2	Class Number	AP2021225000189
Duration	90 minutes	Total Marks	50

ANSWER ALL THE QUESTIONS

(MARKS ARE MENTIONED IN SQUARE BRACKET)

Q1.

- a. Suppose in relation schema R(A, B, C, D, E, F, G, M, I, J) has the following functional dependencies:

$$f.d. = \{B \rightarrow C;$$

$$A \rightarrow D, E;$$

$$F \rightarrow G, M;$$

$$D \rightarrow I, J\}$$

Find out the candidate key(s). Also, find out the super key(s) which are not candidate keys. [6.5]

- b. Suppose R(A, B, C, D) with

$$F = \{\{A, B\} \rightarrow C, D;$$

$D \rightarrow A\}$ has been divided into R1(A,D) and R2(B,C,D).

Check the said decomposition is functional dependency preserving or not? [6]

Q2.

Suppose in R(A, B, C, D, E, F), we have a set of functional dependencies,

$$f.d. = \{\{A, B, D\} \rightarrow A, C;$$

$$C \rightarrow B, E;$$

$\{A,D\} \rightarrow B,F;$

$B \rightarrow E\}$.

Find a minimal cover of the given set of f.d. [12.5]

Q3.

Consider the following relations with their attributes:

EMPLOYEE(fname, lname, ssn, sex, salary, super_ssn, dno, city, birth_date)

DEPENDENT(ssn, dependent_name, sex, relationship, birth_date)

DEPARTMENT(Dname, Dnumber, Mgr_ssn, Mgr_start_date)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

DEPT_LOCATIONS(Dnumber, Dlocation)

ssn stands for social security number of an employee, super_ssn stands for supervisor's ssn, essn stands for employee's ssn. ssn is the primary key of EMPLOYEE relation and essn is the foreign key of DEPENDENT relation referring to the EMPLOYEE relation. Mgr_ssn is manager ssn which is a Foreign Key(FK) in DEPARTMENT table and referring to EMPLOYEE table, Dnum is FK in PROJECT table referring to DEPARTMENT table. Pname stands for project name. Essn is FK in WORKS_ON table referencing primary key of EMPLOYEE table and Pno is also FK in WORKS_ON table referencing Pnumber in PROJECT table. Dnumber is the foreign key in DEPT_LOCATIONS referencing DEPARTMENT table. Mgr_start_year is the year when a manager started managing the corresponding department.

Write the queries in SQL to achieve the following:

- a. Find out the number of female employees working under each department located in Guntur. [3]
- b. Retrieve names of such employees who earn not less than 80000 and have female dependents. [3]
- c. Find the department name, fname, lname of male employees who have salary greater than at least one employee working under department number 2. [3]
- d. Find details of projects where number of employees working are more than 50. [3]
- e. Write the sql statement to define table DEPENDENT as mentioned above. Also set proper constraint to restrict null entries in each of the columns. [3]

Q4.

Consider the following relations with their attributes:

EMPLOYEE(fname, lname, ssn, sex, salary, super_ssn, dno, address, birth_date)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

Draw the initial query tree for the following SQL query. Then apply heuristic query optimization on that initial query tree to find the final query tree (if any) that is efficient to execute.

```
SELECT E.Fname, P.Dnum, P.Pname FROM EMPLOYEE AS E, WORKS_ON AS W,  
PROJECT AS P WHERE E.Ssn = W.Essn AND W.Pno = P.Pnumber AND P.number >5  
AND E.fname= '_%oa';
```

[10]

QP Mapping

QP Mapping					
Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped
Q1	3	CO3	PO1, PO2, PO3, PO4		12.5
Q2	3	CO3	PO1, PO2, PO3, PO4		12.5
Q3	3	CO4	PO1, PO2, PO3, PO5		15
Q4	4	CO4	PO1, PO2, PO3, PO5		10

TEMPLATE FOR QUESTION PAPER

Name of the Examination: CAT 2

School	SCOPE	AP2021225000190
Course Code	CSE 2007	Course Title
Semester	IV	Date of exam
Slot	B1/TB1	Faculty Name & ID
Duration	90 min	Total Marks
		50

Q1. A relational schema for a train reservation database is given below.

Passenger (pid, pname, age)

Reservation (pid, tno, class, date), train(tno,thname,source,destination)

Write the following queries in SQL

- a) Retrieve the passenger names whose age is above 30 and below 50. (2M)
- b) Retrieve the list of train numbers, train names that travel from Chennai to Vijayawada. (2M)
- c) Retrieve the names of passengers who reserved in First Class in Rajdhani Express. (3M)
- d) Retrieve the list of the names of passengers travelling on 16-4-2022. (2M)
- e) Find the total number of passengers travelling from Vijayawada to Kolkata (3)
- f) Find the list of passengers with same name travelling in same train with different sources and destinations. (3M)

Q2. a) Let $R = (A, B, C)$ be a relation with functional dependencies given by $F = \{A \rightarrow BC\}$ $A \rightarrow B$ $AB \rightarrow C\}$. Find the minimal cover of F .(5M)

b) Given Relation $R(A, B, C, D, E)$ and set $F = \{A \rightarrow B, A \rightarrow C, C \rightarrow A, BD \rightarrow E\}$ of functional dependencies, find a decomposition of R into 3NF relations that is lossless-join and dependency preserving. (7.5 M)

Q3. Consider the relation schema $R (A, B, C, D, E, G)$ with functional dependencies

$F = \{AB \rightarrow C, AG \rightarrow E, B \rightarrow D, E \rightarrow G\}$. Notice F is the minimum cover of itself.

For each of the following decompositions $R (A, B, C, D, E, G)$, determine whether it is

(a) dependency-preserving, and

(b) lossless.

i) $\{ABC, CDE, EG\}$ (6 .5 M)

ii) {ABCD, AEG} (6M)

Q4. Write a SQL query to retrieve the name of all the dependents of employees who work for the 'Accounts' department having Salary greater than 50000 and city in Vijayawada using the following schema.

Employee (Empno, Ename, bdate, City, Sal, Dno)

Department (Dno, Dname, Dmrgno)

Dependent (DepName,Empld,age,relationship)

Draw the initial query tree and show the steps how to optimize the query using heuristic optimization algorithm. (10 M)

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO4				15
Q2	3	CO3				12.5
Q3	3	CO3				12.5
Q4	4	CO3				10

TEMPLATE FOR QUESTION PAPER

Name of the Examination: CAT 2

School	SCOPE	AP2021225000191	
Course Code	CSE 2007	Course Title	DBMS
Semester	IV	Date of exam	19-4-2022
Slot	B2	Faculty Name & ID	Hari Seetha
Duration	90 min	Total Marks	50

1. Consider the following relational schema

SUPPLIER (Sno, Sname)
PART (Pno, Pname, price, color)
PROJECT (Jno, Jname)
SUPPLY (Sno, Pno, Jno)

 - a. List the part names that are not supplied. (3M)
 - b. List the parts supplied by two different suppliers to Project J1 (3M)
 - c. Find the part name of the most expensive part (3M)
 - d. Retrieve the project names that are supplied by supplier ‘S1’ only. (3M)
 - e. Retrieve the suppliers who supply yellow part and red part (3M)
2. Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $G = \{A, B\} \rightarrow \{C\}, \{B, D\} \rightarrow \{E, F\}, \{A, D\} \rightarrow \{G, H\}, \{A\} \rightarrow \{I\}, \{H\} \rightarrow \{J\}$. Determine the key of R. Decompose R into 2NF and then 3NF relations. 12.5M
3. Which of the following decompositions of $R = ABCDEG$, with the set of dependencies? $FF = \{AB \rightarrow C, AC \rightarrow B, AD \rightarrow E, B \rightarrow D, BC \rightarrow A, E \rightarrow G\}$, is (a) dependency-preserving?
 (b) lossless-join $D1 = \{AB, BC, ABDE, EG\}$ and $D2 = \{ABC, ACDE, ADG\}$ 12.5M
4. Consider the following schema. Write the sql query, transform it to relational algebra expression and optimize it using Heuristic Query Optimization. 10M

SALES (Custid, Productid, Date, Qty_sold)
CUST (Custid, Custname, Country, Cemail)
PRODUCT (Productid, Pname, Qty_onhand)

List customers from France who have bought more than 50 units of a product “Ring_234”

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO4				15
Q2	3	CO3				12.5
Q3	3	CO3				12.5
Q4	4	CO3				10



VIT-AP UNIVERSITY

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Web: www.vitap.ac.in

Exam Name: CAT2

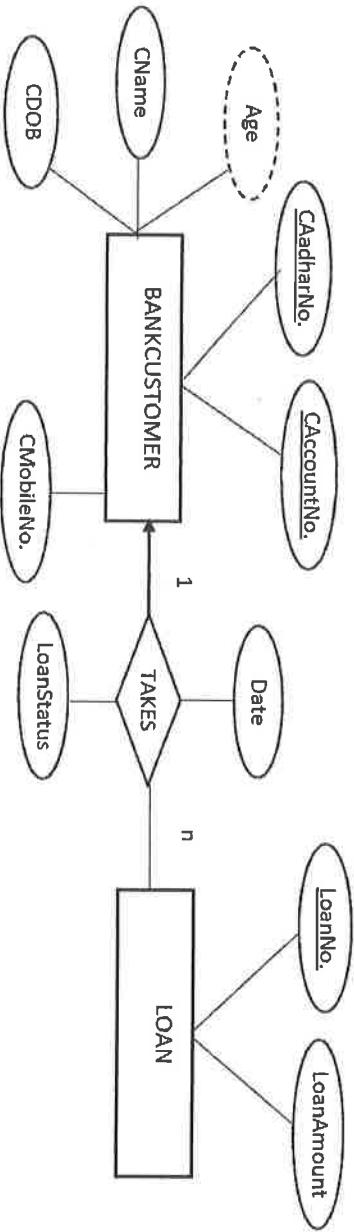
Paper Name: Database Management Systems
Paper Code: CSE 2007
Session: WIN Sem 2021-22

Marks: 50

Duration: 90 minutes

Answer all the four questions

1.
 - a) For a relation $R(A, B, C, D, E)$ with the following dependencies FD: $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow E, E \rightarrow A\}$, how many candidate keys are there in the relation R and what is its highest normal form? (3+3 Marks)
 - b) List number of super keys possible for a relation $R(\underline{A}, \underline{B}, C, D)$, where A and B are two separate candidate keys. (4 Marks)
 - c) What is the highest normal form for a relation $R(A, B)$ with two attributes A and B - prove your claim. (3 Marks)
2. Consider the following ER model. Now based on that model write the SQL statements for the following events.
 - a) List those customer's names who have repaid the loans. (3 Marks)
 - b) List those customer names who have not taken any loan from the Bank (Use MINUS/NOT IN/ NOT EXIST/EXCEPT keyword separately to show the results). (10 Marks)
 - c) Find the maximum loan amount issued by the bank to customer. (2 Marks)



The schemas for all the tables are given below:

BANKCUSTOMER(CAccountNo., CAadharNo., CName, CDOB, CMobileNo.) // CAccount is Primary key
LOAN(LoanNo., LoanAmount) // LoanNo. is primary key
TAKES(CAccountNo., LoanNo., Date, LoanStatus) // LoanNo. is Foreign key referencing **Loan**(LoanNo.)
and also LoanNo. is primary key in table TAKES.

3.

- a) Why we need to perform Query Optimization in SQL - explain? (3 Marks)
- b) Consider the following three DB tables Employee(Fname, Lname, SSN, Bdate), Works_On(ESSN, PNO, Hours) and Project(Pname, Pnumber, Plocation). Represent the following query into an expression tree first then optimize it. Show the intermediate steps of optimization using expression tree. (7 Marks)

$\Pi_{Lname}(\sigma_{Pname = "Dia"} \wedge Pnumber = Pno \wedge ESSN = SSN \wedge Bdate > 01\text{-Jan-}2010(Employee \times Works_On \times Project))$

4.

- a) Let a relation R(A, B, C, D, E) with the following dependencies FD: {A \rightarrow C, B \rightarrow D, C \rightarrow E, D \rightarrow E} is decomposed into three sub-relations R1(A,C), R2(B,C,D), R3(D,E). Now, check whether the made decomposition is lossy or not. (4 Marks)
- b) Let a relation R(A, B, C, D, E) with the following dependencies FD: {A \rightarrow B, B \rightarrow C, C \rightarrow E, D \rightarrow E} is decomposed into three sub-relations R1(A,B), R2(B,C,D), R3(D,E). Now, check whether the made decomposition is dependency preserving or not. (3 Marks)
- c) Find the canonical cover for the following set of FDs over relation R(W,X,Y,Z). (5 Marks)
FDs: {X \rightarrow W, WZ \rightarrow XY, Y \rightarrow WXZ}

QP MAPPING

-Op.Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	2,3	1,2,3,4	-	-	13
Q2	3	2,3	1,2,3,4	-	-	15
Q3	4	4	1,2,3,5	-	-	10
Q4	3	2,3	1,2,3,4	-	-	12

Exam Name: CAT2

Date of Exam: 19.4.2022

Class ID: AP2021225000193

Slot: B2+TB2

Paper Name: Database Management Systems
 Paper Code: CSE 2007
 Session: WIN Sem 2021-22

Marks: 50

Duration: 90 minutes

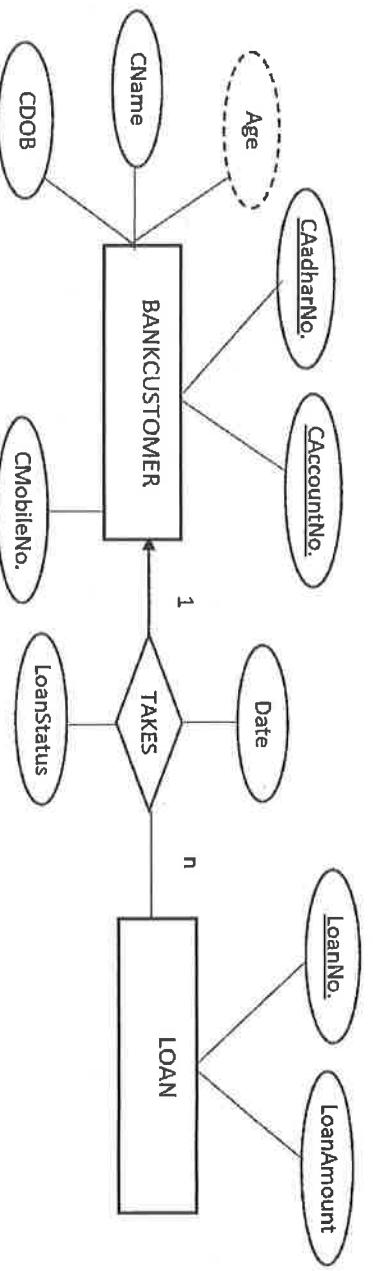
Answer all the four questions

1.

- Let a relation $R(A, B, C, D, E)$ with the following dependencies FD: $\{A \rightarrow B, B \rightarrow C, C \rightarrow E, D \rightarrow E\}$ is decomposed into three sub-relations $R1(A,B), R2(B,C,D), R3(D,E)$. Now, check whether the made decomposition is lossy or lossless. (4 Marks)
- Prove a relation with cyclic dependencies between all the attributes always is in BCNF. (3 Marks)
- Find out the canonical set for the following relation $R(A,B,C,D,E,F)$ which holds the following dependencies $\{AB \rightarrow C, B \rightarrow CD, D \rightarrow EF, B \rightarrow F\}$ (5 Marks)

2.

- List top five highest amount loans issued by the bank. (3 Marks)
- List those customer names who have not taken any loan from the Bank (Use independent query and correlated query to write the following expression) (6 Marks)
- Find the average loan amount issued by the bank to customer. (3 Marks)
- List those customer names who have an account or have taken a loan or both. (3 Marks)



The schemas for all the tables are given below:

BANKCUSTOMER(CAccountNo., CAadharNo., CName, CDOB, CMobileNo.) //CAccount is Primary key
LOAN(LoanNo., LoanAmount) // LoanNo. is primary key
TAKES(CAccountNo., LoanNo., Date, LoanStatus) // LoanNo. is Foreign key referencing Loan(LoanNo.)
 and also LoanNo. is primary key in table TAKES.

3.

- a) Classify different types of query optimizations with examples. (3 Marks)
 b) Consider the three DB tables as follows **Instructor(dept_name, instructor_ID)**, **Teaches(Subject, instructor_ID, year, course_ID)** and **Course(title, course_ID)**. Represent the following query into an expression tree first then optimize it. Show the intermediate steps of optimization using expression tree. (7 Marks)

$\Pi_{name, title}(\sigma_{dept_name = "Music"} \wedge year = 2009 (instructor \bowtie (teaches \bowtie \Pi_{course_id, title} (course))))$

4.

- a) For a relation R(A, B, C, D, E, F) with the following dependencies FD: {AB \rightarrow C, C \rightarrow DE} how many candidate keys are there in the relation R and what is its highest normal form? (3+2 Marks)
 b) List number of super keys possible for a relation R(A, B, C, D), where AB is a composite candidate key. (4 Marks)
 c) Differentiate between Candidate key, Super key, Primary key, Foreign key and Alternate key (4 Marks)

QP MAPPING

-;Op.Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	2,3	1,2,3,4	-	-	12
Q2	3	2,3	1,2,3,4	-	-	15
Q3	4	4	1,2,3,5	-	-	10
Q4	3	2,3	1,2,3,4	-	-	13



Name of the Examination: CAT 2

School	Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	WIN 2021-22	Date of exam	21.4.2022
Slot	D1+TD1	Faculty Name & ID	Sandipan Maiti (70125)
Duration	90 Minutes	Total Marks	50

Q1 A Relation R (M, N, O, P, Q) with functional dependencies FD1= {M→N; MN→O; P→MO; P→Q} and FD2 = {M→NO; P→MQ}. 10

“FD1 and FD2 are not equivalent”- is this statement true or False? Explain with Prove.

Q2 A Relation R (X, Y, Z, S, T) with functional dependencies F(X→YZ; ZS→T; Y→S; T→X). 15

A. Find F^+ for relation R.(6)

B. Perform normalization up to BCNF on R, considering YZ as key. (9)

Q3 Employee (Fname, Ssn, Bdate, Address, Gender, Salary, Super_ss_n, Dno); 15

Department (Dname, Dnumber, MGR_ss_n, MGR_startdate);

Dept_Location (Dnumber, Dlocation);

Works_on (Essn, Pno, Hours);

Project (P_name, P_no, P_location, D_number);

Dependent (Essn, Dependent_name, Gender, DOB, Relation);

A) List the departments spread over multiple location. (3)

B) Find the employee names who is spending highest amount of time or lowest amount of time for projects in the organization. (4)

C) Find the employees who don't have department. (4)

D) Find the employee wise average working hours in each project. (4)

Q4 Address the importance of query optimizer. (4) 10

Make a query graph for the below Query. (6)

Employee (Fname, Ssn, Bdate, Address, Gender, Salary, Super_ss_n, Dno);
Department (Dname, Dnumber, MGR_ss_n, MGR_startdate);

Query: Select D.Dname, average(salary) from Employee E, Department D where
E.Dno=D.Dnumber group by(Dname);

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO3				10
Q2	3	CO3				15
Q3	3	CO4				15
Q4	4	CO4				10

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class ID: AP2021225000195

Course Code: CSE 2007

Slot: B1+TB1

Duration: 90 min

Total Marks: 50

Q1. a) The table shown in Figure.1 is susceptible to update anomalies. Provide examples of insertion, deletion, and modification anomalies.

7M

staffNo	dentistName	patientNo	patientName	appointment date	time	surgeryNo
S1011	Tony Smith	P100	Gillian White	12-Aug-03	10.00	S10
S1011	Tony Smith	P105	Jill Bell	13-Aug-03	12.00	S15
S1024	Helen Pearson	P108	Ian MacKay	12-Sept-03	10.00	S10
S1024	Helen Pearson	P108	Ian MacKay	14-Sept-03	10.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Oct-03	16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Oct-03	18.00	S13

Figure 1: Details of patient dental appointments.

b). Find all functional dependencies for the relational table given below. 8M

Column1	Column2	Column3	Column4	Column5
A	C	I	F	Q
B	C	O	F	P
A	D	I	F	T
B	D	O	F	Q
A	E	I	R	T
B	E	O	R	T

Q2. Suppose that we decompose the schema $R = (A, B, C, D, E)$ into $(A, B, C)(A, D, E)$. Show that this decomposition is a lossless-join decomposition if the following set F of functional dependencies holds:

10M

- A → BC
- CD → E
- B → D
- E → A

Q3. a) Consider the following relations

Person (name, street, city)

Owns (name, reg_no, model, year)

Accident (date, reg_no)

Answer the following using SQL.

- Find the names of persons who are not involved in any accident.
- Find the names and street of persons who own a maruti car.
- Find the registration numbers of the cars manufactured in the year 2004.

b) Consider the following database with primary keys underlined

Project(P_No, P_Name, P_Incharge)

Employee(E_No, E_Name)

Assigned_To(P_No, E_No)

Write the SQL for the following:

- List details of the employees working on all the projects.
- List E_No of employees who do not work on project number PB2003.

4. a) Query Optimization Given the following SQL query:

10M

Student (sid, name, age, address)

Book(bid, title, author)

Checkout(sid, bid, date)

```
SELECT S.name FROM Student S, Book B, Checkout C  
WHERE S.sid = C.sid AND B.bid = C.bid AND B.author = 'Olden Fames' AND  
S.age > 12 AND S.age < 20
```

And assuming:

- There are 10, 000 Student records stored on 1, 000 pages.
- There are 50, 000 Book records stored on 5, 000 pages
- There are 300, 000 Checkout records stored on 15, 000 pages.
- There are 500 different authors.
- Student ages range from 7 to 24.

- Show a physical query plan for this query, assuming there are no indexes and data is not sorted on any attribute.
- Compute the cost of this query plan and the cardinality of the result.

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	C03	P02, P03, P05;	P02, P03, P05;	PS01, PS02, PS04	15
Q2	3	C03	P02, P03, P05;	P02, P03, P05;	PS01, PS02, PS04	10
Q3	3	C04	P05	P05	PS01, PS02	15
Q4	4	C04	P05	P05	PS01, PS02	10

8M

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class ID: AP2021225000196

Course Code: CSE 2007

Slot: B2+TB2

Duration: 90 min

Total Marks: 50

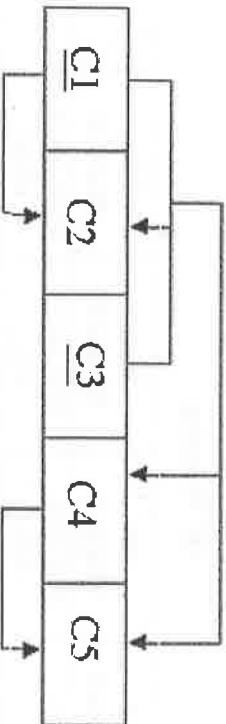
Q1.

- a). The table shown below is susceptible to update anomalies. Provide examples of insertion, deletion, and modification anomalies.
- 7M**

NIN	contractNo	hoursPerWeek	eName	hotelNo	hotelLocation
113567WD	C1024	16	John Smith	H25	Edinburgh
234111XA	C1024	24	Diane Hocine	H25	Edinburgh
712670XD	C1025	28	Sarah White	H4	Glasgow
113567WD	C1025	16	John Smith	H4	Glasgow

- b). Compute the closure of the following set F of functional dependencies for relation schema R = (A, B, C, D, E). A → BC CD → E B → D E → A List the candidate keys for R? In what normal form is R?
- 6M**

2. a). Given the dependency diagram shown in the following figure, (the primary key attributes are underlined).
- 7M**



- (i) Identify and discuss each of the indicated dependencies.
(ii) Create a database whose tables are atleast in 3NF, showing dependency diagram for each table.

b). A Relation R (A, B, C, D, E) with functional dependencies F ($A \rightarrow BC$; $CD \rightarrow E$; $B \rightarrow D$; $E \rightarrow A$). Find all candidate keys for relation R.. **5M**

Q3. Consider the following relations with key underlined **15M**

lives (person_name, street, city)
 works (person_name, company_name, salary)
 located (company_name, city)
 manages (person_name, manager_name)

Answer the following using SQL:

- Find the names and city of persons who work for manager John.
- Find the names of persons who live in the same city as the company they work for.
- John's manager has changed. The new manager is Anna.
- Susan doesn't work anymore.
- Create a view BangWork (person_name, company_name, manager_name) of all people who work in Bangalore in ascending order of person name

Q4. Consider the relations **10M**

Given the following relations :
 vehicle (reg_no, make, colour)
 Person (eno, name, address)
 Owner (eno, reg_no)

For the query

Select eno, name, reg_no
 From Person, Owner
 Where Person.eno = Owner.eno and Person.name = 'Hari'

- Draw the initial query tree.
- Optimise the query and draw the optimised query tree.

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	C03	P02, P03, P05;	P02, P03, P05;	PS01, PS02, PS04	13
Q2	3	C03	P02, P03, P05;	P02, P03, P05;	PS01, PS02, PS04	12
Q3	3	C04	P05	P05	PS01, PS02	15
Q4	4	C04	P05	P05	PS01, PS02	10

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class number: AP2021225000197

Course Title: Database Management Systems

Date of Exam: 19-04-2022

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. Given a relation $R \{A, B, C, D, E\}$ and a Functional Dependency set $FD = \{A \rightarrow B, B \rightarrow E, C \rightarrow D\}$.

- I. Find all the super keys and candidate keys. (6M)
- II. Determine whether the given R is in 3NF? If not convert it into 3NF. (6.5M)

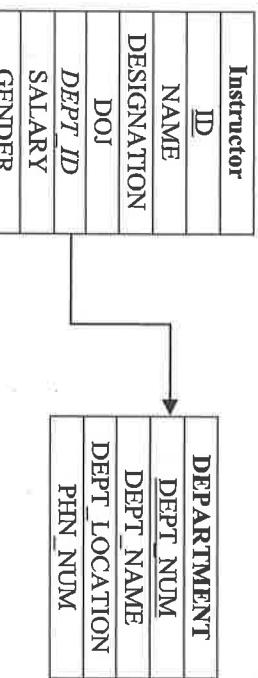
(12.5M)

Q2. Given a relation $R \{P, Q, R, S, T\}$ and a Functional Dependency set $F = \{P \rightarrow QRST, RS \rightarrow T\}$.

- I. Find the minimal cover for the given functional dependencies. (8M)
- II. Also prove the equivalency of the minimal cover with F. (4.5M)

(12.5M)

Q3. Consider the following relation schemas (Underlined attributes are primary keys, Italic font indicates a foreign-key attribute):



Write the following queries in SQL:

- a) Write queries to create the following schemas while ensuring all the constraints. (2M)
- b) Find the IDs of the highest-paid instructors in each department. (3M)
- c) Retrieve the IDs of the top five highest-paid instructors using subquery. (3M)
- d) Retrieve the details of instructors who are having their office in department 'ABC'. (3M)

- e) Retrieve the IDs and names of instructors whose names begin with the letter 'A'. (2M)
 f) Retrieve the lowest salaries of the instructors grouped by gender. (2M)

Q4. Consider the following relation schemes: (15M)

- Faculty (ID, name, dept_name)
- Teaches (ID, course_id, sec_id, semester, year)
- Course (course_id, title, dept_name, credits)

Find an optimized query tree for the following query: **Find the IDs and names of all the SCOPe faculty members who teach in the fourth semester, along with the titles of the courses they teach. Show all the steps in detail.** (10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	C03	PO1, PO2, PO3, PO4	-	-	12.5
Q2	3	C03	PO1, PO2, PO3, PO4	-	-	12.5
Q3	3	C04	PO1, PO2, PO3, PO5	-	-	15
Q4	4	C04	PO1, PO2, PO3, PO5	-	-	10

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class number: AP2021225000198

Course Title: Database Management Systems

Date of Exam: 19-04-2022

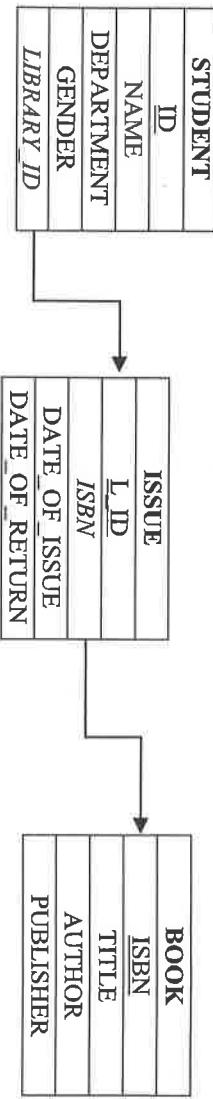
Duration: 90 min

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
 2. Any assumptions made should be clearly stated.
- Q1.** Given a relation R ($A, B, C, D, E, F, G, H, I, J$) and a Functional Dependency set $FD = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}$.
- I. Find all the super keys and candidate keys. **(6M)**
 - II. Determine whether the given R is in 3NF? If not convert it into 3NF. **(6.5M)**
- (12.5M)**
- Q2.** Given a relation R (M, N, O, P) and a Functional Dependency set $F = \{M \rightarrow NO, N \rightarrow O, MN \rightarrow P\}$.
- I. Find the minimal cover for the given functional dependencies. **(8M)**
 - II. Also prove the equivalency of the minimal cover with F . **(4.5M)**
- (12.5M)**

- Q3.** Consider the following relation schemas (Underlined attributes are primary keys, Italic font indicates a foreign-key attribute):



Write the following queries in SQL: (3 marks each)

- a) Write queries to create the following schemas while ensuring all the constraints.
- b) Retrieve the title and authors of the books issued by the student 'RAM'.
- c) Retrieve the names of students who have issued a book published by 'PEARSON' publisher.
- d) Retrieve the title of all books issued on or before April 1, 2022.
- e) Find the ISBN of books that were never issued.

(15M)

Q4. Consider the following relation schemes:

- Employee (ID, Name, D_Name)
- Department (D_Name, Location)
- Manages (D_Name, ID, Starting_Date)

Find an optimized query tree for the following query: Retrieve all the IDs of employees who work in the department managed by Professor 'ABC'. Show all the steps in detail. (10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO3	PO1, PO2, PO3, PO4	-	-	12.5
Q2	3	CO3	PO1, PO2, PO3, PO4	-	-	12.5
Q3	3	CO4	PO1, PO2, PO3, PO5	-	-	15
Q4	4	CO4	PO1, PO2, PO3, PO5	-	-	10



QUESTION PAPER

Name of the Examination: CAT - 2

School	School of Computer Science & Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	2	Date of exam	22.04.2022
Slot	E2+TE2 (AP2021225000199)	Faculty Name & ID	Dr. Koteswararao CH & 70278
Duration	110 Minutes	Total Marks	50

Q1. A) A Relation R (A, B, C, D, E, F) with functional dependencies

$$FD1 = \{A \rightarrow BC; B \rightarrow CDE; AE \rightarrow F\} \text{ and}$$

$$FD2 = \{A \rightarrow BCF; B \rightarrow DE; E \rightarrow AB\}.$$

FD1 and FD2 are equivalent"- is this statement true or False? Explain with Prove.

6 M

B) Find F^+ for relation R for the following data.

A Relation R (A, B, C, D, E) with functional dependencies

$$F(AB \rightarrow C; D \rightarrow E; AB \rightarrow E; E \rightarrow C).$$

6.5 M

Q2. Some of the most difficult decisions that you face as a database developer are what tables to create and what columns to place in each table, as well as how to relate the tables that you create. Normalization is the process of applying a series of rules to ensure that your database achieves optimal structure. Normal forms are a progression of these rules. Each successive normal form achieves a better database design than the previous form did.

Consider the Students table, with the primary key underlined, and the following data:

Students:

Alpha	Name	Email	Courses	GradePoints
100111	John Doe	doe@usna.edu	NN204, SI204, IT221	2,3,3
092244	Matt Smith	smith@usna.edu	SM223, EE301	4,4
113221	Melinda Black	black@usna.edu	SI204	3
090112	Tom Johnson	Johnson@usna.edu	NN204, SI204, IT221	4,2,3

- A) What are insertion anomalies, deletion anomalies and update anomalies? 3 M 3 M
- B) Is the Students table in 1NF? Why? 3 M
- C) If the Students table is not in 1NF, redesign the tables such that all the information currently in the Students table is found in the resulting tables, and the resulting tables are in 1NF. For each of the resulting tables, give the table name, column names, primary keys, and foreign keys. 3.5 M 3 M
- D) After the C) step is the resultant table is in 2 NF? Justify your answer

Q3.A) Consider the following data to answer the queries.

PRODUCT	COMPANY	QTY	RATE	COST
Item1	XYZ	2	10	20
Item2	PQR	3	25	75
Item3	XYZ	2	30	60
Item4	ABC	5	10	50
Item5	PQR	2	20	40
Item6	XYZ	3	25	75
Item7	XYZ	5	30	150
Item8	XYZ	3	10	30
Item9	PQR	2	25	50
Item10	ABC	4	30	120

A) Answer the following questions in SQL format.

- Find the total number of products and total number of companies in the given data? 3M
- Find the average of the cost and maximum rate in the xyz company. 3M
- Find the minimum cost of abc company whose qty is equal to 4 and maximum cost of pqr company whose rate is greater than or equal to 25. 3 M
- Find the total number of companies in the given database table? 3 M

B) Answer the following questions in SQL format.

Given the following tables:

```
ITEM( ItemID,
      Description,
      PurchaseDate,
      Store,
      City,
      Quantity,
      LocalCurrencyAmt,
      ExchangeRate)
```

```
SHIPMENT_ITEM(ShipmentID,
               ShipmentItemNb,
               ItemID,
               Value)
```

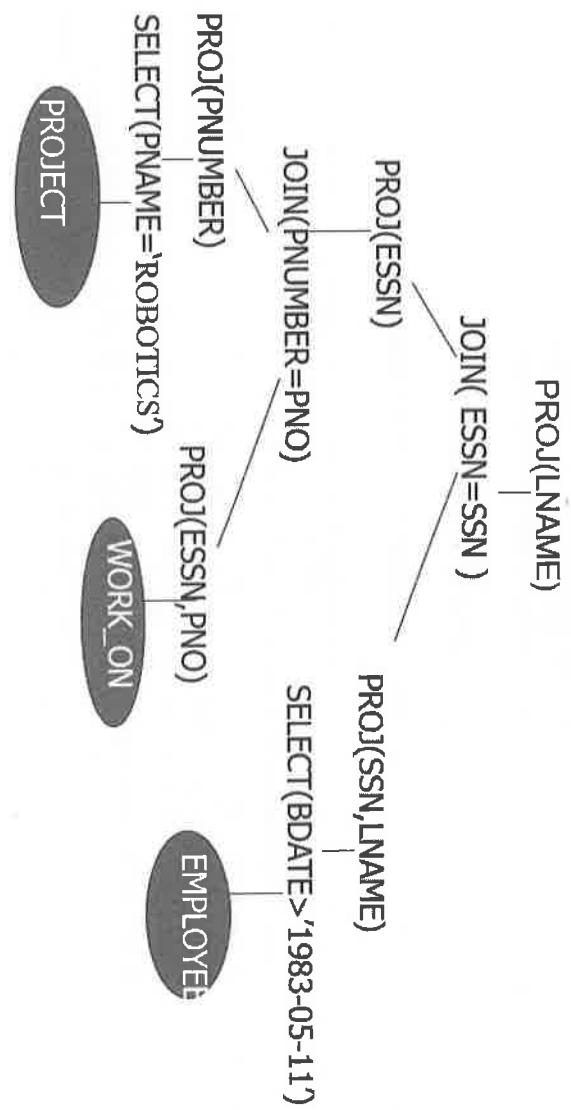
Write the SQL query to find the ItemID and Description for the item with the lowest shipped Value. 3 M

Q4. **What are the query optimization rules?** 4 M

Explain the steps involved in query optimization for the following query? 6 M

```
SELECT LNAME
FROM EMP, WORK, PROJECT
WHERE PNAME='ROBOTICS'
AND PNUMBER=PNO
AND ESSN=SSN
```

AND BDATE > '1983-11-05'



QP Mapping						
Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	
Q1	3	3	PO1, PO2, PO3, PO5, PO9	PEO1, PEO2, PEO3, PEO4	PSO1, PSO2	12.5
Q2	3	3	PO1, PO2, PO3, PO5, PO9	PEO1, PEO2, PEO3, PEO4	PSO1, PSO2	12.5
Q3	4	4	PO1, PO2, PO3, PO5, PO9	PEO1, PEO2, PEO3, PEO4	PSO1, PSO2	15
Q4	4	4	PO1, PO2, PO3, PO5, PO9	PEO1, PEO2, PEO3, PEO4	PSO1, PSO2	10



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QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class ID: AP2021225000200

Course Code: CSE2007

Slot: B1+TB1

Duration: 90 minutes

Total Marks: 50

Q1. A. Consider a database table T containing two columns X and Y each of type integer. After the creation of the table, one record (X=1, Y=1) is inserted in the table. Let MX and MY denote the respective maximum values of X and Y among all records in the table at any point in time. Using MX and MY, new records are inserted in the table 1024 times with X and Y values being MX+1, 2*MY+1 respectively. Each time after an insertion, values of MX and MY change. What will be the output of the following SQL query after the steps mentioned above are carried out? (4 Marks)

SELECT Y FROM T WHERE X=10;

B. Consider the following sequence of SQL code, and predict the output of the SELECT statement. (3 Marks)

```
CREATE TABLE Loan(Borrower text, Manager text, Amount integer);
INSERT INTO Loan VALUES('Varun','Chandu',10000);
INSERT INTO Loan VALUES('Sanjana','Joshiika',20000);
SELECT COUNT(*)
FROM ((SELECT Borrower, Manager FROM Loan)
NATURAL JOIN ( SELECT Manager, Amount FROM Loan));
```

C. Consider the following database table FIFA.

Player	Country	Goal
Chaitanya	Egypt	16
Prashanth	Morocco	15
Satwik	Egypt	14
Pradeep	Ghana	13
Manikanta	Nigeria	12
Akhilesh	Algeria	11
Aviraj	Cameroon	11
Surya	Tunisia	10
Harish	Egypt	10
Niradesh	Egypt	10

For the above given instance of the table FIFA, predict the output of the following SQL query: (4 Marks)

```
SELECT COUNT(*) FROM
(SELECT Player FROM FIFA
WHERE Goal > (SELECT MIN(Goal) FROM FIFA WHERE Country = 'Egypt'));
```

D. Consider the following sequence of SQL code, and predict the output of the SELECT statement. (4 Marks)

```
CREATE TABLE employee(
```

```
id INTEGER,
name TEXT,
department TEXT,
salary INTEGER
);
```

```
INSERT into employee values(1,'Ankur','HR',10000);
INSERT into employee values(2,'Pavani','Marketing',20000);
INSERT into employee values(3,'Aayush','HR',30000);
INSERT into employee values(4,'Binit','Marketing',40000);
INSERT into employee values(5,'Aditya','IT',50000);
INSERT into employee values(6,'Jasjot','IT',60000);

SELECT e1.id FROM employee e1 WHERE e1.salary >
(SELECT AVG(e2.salary) FROM employee e2 WHERE e2.department=e1.department);
```

Q2. A. Consider a relational schema R(V W X Y Z) with a set of functional dependencies F.

F: { X->Y V

Y->Z

Z->Y

VW->X }

Determine all possible super keys that can be derived from R. (4.5 Marks)

B. Consider a relational schema R(V W X Y Z) with a set of functional dependencies F.

F: X->Y V

Y->Z

Z->Y

VW->X

What is the highest normal form satisfied by R? (3 Marks)

C. Consider a relational schema R (A B C D E) with the following set of functional dependencies F.

F: A->B

AB->C

D->ACE

Find the minimal cover of R. (5 Marks)

Q3. A. Consider a relational schema R (A B C D) with two sets of functional dependencies as stated below:

F1: A->B

B->C

C->D

F2: A->BC

C->D

Check if F1 and F2 are equivalent. (4 Marks)

B. Consider a relational schema R ($V W X Y Z$) with a set of functional dependencies F.

$$F: V \rightarrow W$$

$$V \rightarrow X$$

$$Y \rightarrow X$$

$$Y \rightarrow Z$$

Suppose, R is decomposed into $R_1(V W Y)$ and $R_2(Y X Z)$. Check if the decomposition is lossless and dependency preserving. (6 Marks)

C. A relational schema with two attributes is always in BCNF. Is this statement true or false? Justify your answer briefly. (2.5 Marks)

Q4. A database table T1 has 1000 records and occupies 40 disk blocks. Another table T2 has 400 records and occupies 20 disk blocks. The memory buffer space available can hold exactly one block of records for T1 and one block of records for T2 simultaneously at any point in time. No index is available on either of the tables. Then, calculate the number of block transfers and seeks required in each of the below specified join conditions:

- i. T1 in the outer loop, T2 in the inner loop with nested-loop join algorithm (5 Marks)
- ii. T2 in the outer loop, T1 in the inner loop with nested-loop join algorithm (5 Marks)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	C04	PO1, PO2, PO3, PO5			15
Q2	3	C03	PO1, PO2, PO3, PO4			12.5
Q3	3	C03	PO1, PO2, PO3, PO4			12.5
Q4	4	C04	PO1, PO2, PO3, PO5			10



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QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class ID: AP2021225000201

Course Code: CSE2007

Slot: B2+TB2

Duration: 90 minutes

Total Marks: 50

Q1. A. The relation book (title, 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? (4 Marks)

```
select title from book as B where  
(select count(*) from book as T where T.price > B.price) <= 10
```

B. Consider the following sequence of SQL code, and predict the output of the SELECT statement. (3 Marks)

```
CREATE TABLE Loan(Borrower text, Manager text, Amount integer);  
INSERT INTO Loan VALUES('Prem','Ayushi',100000);  
INSERT INTO Loan VALUES('Tanishq','Ayushi',200000);  
INSERT INTO Loan VALUES('Shivam','Ayushi',300000);  
SELECT COUNT(*)  
FROM (( SELECT Borrower, Manager FROM Loan)  
NATURAL JOIN ( SELECT Manager, Amount FROM Loan));
```

C. Consider the following database table Student.

identity	name	specialization	marks
1	Anurag	BCE	90
2	Rishabh	BCE	80
3	Soham	BCI	70
4	Sohan	BCI	90
5	Ashfaaq	BCN	95
6	Charitesh	BCN	75
7	Charan	BCR	75
8	Harsha	BCR	85

For the above given instance of the table Student, predict the outputs of the following SQL queries: (2 * 4 Marks)

- select s.name from Student as s where
1 = (select count(*) from Student as t where t.marks>s.marks);
- select s.name from Student as s where
1 >= (select count(*) from Student as t where t.marks>s.marks);
- select s.name from Student as s where
not exists(select t.identity from Student as t where t.marks>s.marks);

(iv) select count(*) from (select specialization, marks from Student group by specialization, marks);

Q2. A. Consider a relational schema R(A B C D E F G H I) with a set of functional dependencies F.

F: AB \rightarrow C

BD \rightarrow EF

AD \rightarrow GH

A \rightarrow I

Determine all possible super keys that can be derived from R. (4.5 Marks)

B. Consider a relational schema R(V W X Y Z) with a set of functional dependencies F.

F: WX \rightarrow VYZ

Y \rightarrow W

What is the highest normal form satisfied by R? (3 Marks)

C. Consider a relational schema R (W X Y Z) with the following set of functional dependencies.

F: W \rightarrow X

Y \rightarrow X

Z \rightarrow WXY

WY \rightarrow Z

Find the minimal cover of R. (5 Marks)

Q3. A. Consider a relational schema R (D E F) with two sets of functional dependencies as stated below:

F1: D \rightarrow E

E \rightarrow F

F \rightarrow D

F2: D \rightarrow EF

E \rightarrow D

F \rightarrow D

Check if F1 and F2 are equivalent. (4 Marks)

B. Consider a relational schema R (A B C D E) with a set of functional dependencies F.

F: A \rightarrow BC

CD \rightarrow E

B \rightarrow D

E \rightarrow A

Suppose, R is decomposed into R1(A B C) and R2(A D E). Check if the decomposition is lossless and dependency preserving. (6 Marks)

C. A relational schema without a composite key is always in 2NF. Is this statement true or false? Justify your answer briefly. (2.5 Marks)

Q4. A. A database table T1 has 1000 records and occupies 40 disk blocks. Another table T2 has 400 records and occupies 20 disk blocks. The memory buffer space available can hold exactly one block of records for T1 and one block of records for T2 simultaneously at any point in time. No

index is available on either of the tables. Then, calculate the number of block transfers required in each of the below specified join conditions: (5 Marks)

- i. T1 in the outer loop, T2 in the inner loop with block nested-loop join algorithm
- ii. T2 in the outer loop, T1 in the inner loop with block nested-loop join algorithm

B. Consider the following set of schemas:

Employee= (eid, ename, address)

Project= (pid, pname, type)

Works_for= (eid, pid, charge)

Write an efficient relational algebra expression to find the identities of the employees whose addresses are same as that of the address of 'SUBHRADWIP'. (5 Marks)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	C04	PO1, PO2, PO3, PO5			15
Q2	3	C03	PO1, PO2, PO3, PO4			12.5
Q3	3	C03	PO1, PO2, PO3, PO4			12.5
Q4	4	C04	PO1, PO2, PO3, PO5			10

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Class ID: AP2021225000202

Course Code: CSE2007

Slot: D2+TD2

Duration: 90 minutes

Course Title: DBMS

Date of Exam: 21.4.2022

Total Marks: 50

Q1. For the below given schemas, denote each of the queries using SQL.

Employee= (eid, ename, address)

Project= (pid, pname, type)

Works_on= (eid, pid, charge)

- i. Find the identities of the projects in which both SHIRISH and GEETHIKA work together. (3 Marks)
- ii. Find the identities of the projects for which SHIRISH charges more than GEETHIKA. (4 Marks)
- iii. Find the names of the employees who work on every software based project. (4 Marks)
- iv. Find the identities of the employees whose addresses are same as that of the address of either SHIRISH or GEETHIKA. (4 Marks)

Q2. A. Consider a relational schema R(A B C D E F) with a set of functional dependencies F.

F: ABC \rightarrow D
ABD \rightarrow E
CD \rightarrow F
CDF \rightarrow B
BF \rightarrow D

Determine all possible super keys that can be derived from R. (4.5 Marks)

B. Consider a relational schema R(A B C D) with a set of functional dependencies F.

F: {A \rightarrow B B \rightarrow C C \rightarrow D D \rightarrow A}

What is the highest normal form satisfied by R? (3 Marks)

C. Consider a relational schema R (A B C D E F) with the following set of functional dependencies.

F: A \rightarrow BC
B \rightarrow AC
C \rightarrow D
E \rightarrow F

Find the minimal cover of R. (5 Marks)

Q3. A. Consider a relational schema R (S T U V W X Y) with the following set of functional dependencies as stated below:

$$F: SV \rightarrow X$$

$$SW \rightarrow Y$$

$$VX \rightarrow TU$$

$$W \rightarrow U$$

$$Y \rightarrow W$$

(i) In this example, which of the below given functional dependencies are implied? (5 Marks)

$$Y \rightarrow U$$

$$S \rightarrow Y$$

$$SVX \rightarrow W$$

$$SVU \rightarrow T$$

$$SYX \rightarrow W$$

(ii) Suppose, R is decomposed into R1(S V X), R2(U W), R3(W Y), R4(S T V Y). Will it be a lossless decomposition? Verify. (4 Marks)

B. Consider a relational schema R (W X Y Z) with a set of functional dependencies F.

$$F: W \rightarrow X$$

$$XY \rightarrow Z$$

$$W \rightarrow Y$$

Decompose R into 3NF. Check if the decomposition is lossless and dependency preserving. (3.5 Marks)

Q4. A. A database table T1 has 3000 records and occupies 30 disk blocks. Another table T2 has 400 records and occupies 20 disk blocks. The memory buffer space available can hold exactly one block of records for T1 and one block of records for T2 simultaneously at any point in time. No index is available on either of the tables. Then, calculate the number of block transfers required in each of the below specified join conditions: (5 Marks)

- i. T1 in the outer loop, T2 in the inner loop with nested-loop join algorithm
- ii. T1 in the outer loop, T2 in the inner loop with block nested-loop join algorithm

B. Consider the following set of schemas:

$$\text{Supplier} = (\underline{\text{sid}}, \text{sname}, \text{address})$$

$$\text{Part} = (\underline{\text{pid}}, \text{pname}, \text{color})$$

$$\text{Catalog} = (\underline{\text{sid}}, \underline{\text{pid}}, \text{cost})$$

Draw an optimal query tree to find the identities of the suppliers who supply red parts with a cost less than Rs. 1,000/- . (5 Marks)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO4	PO1, PO2, PO3, PO5			15
Q2	3	CO3	PO1, PO2, PO3, PO4			12.5
Q3	3	CO3	PO1, PO2, PO3, PO4			12.5
Q4	4	CO4	PO1, PO2, PO3, PO5			10



QUESTION PAPER

Name of the Examination: CAT (Long-Summer 2022-2023)

School	School of Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	Long-Summer	Date of exam	01.07.2022
Slot	A+TA+TAA	Faculty Name& ID	Dr. B.Naseeba (70390)
Duration	90 Mins	Total Marks	50

Q1. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL): **10M**

- the NHL has many teams,
- each team has a name, a city, a coach, a captain, and a set of players,
- each player belongs to only one team,
- each player has a name, a position (such as *left wing* or *goalie*), a skill level, and a set of injury records,
- a team captain is also a player,
- a game is played between two teams (referred to as *host_team* and *guest_team*) and has a date (such as *May 11th, 1999*) and a score (such as *4 to 2*).

Analyze the above scenario and answer the following,

a.Design an Entity Relationship Diagram. (**5 Marks**)

b. Convert the ER Diagram into Relational model (**5 Marks**)

Q2.

a. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course: **5M**

STUDENT (SSN, Name, Major, Bdate)

COURSE (Course#, Quarter, Grade)

ENROLL (SSN, Course#, Quarter, Grade)

BOOK_ADOPTION (Course#, Quarter, Book_ISBN)

TEXT (Book_ISBN, Book_Title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make.

b. Analysis the advantages of DBMS over file processing system

5M

Q3. The following relations keep track of airline flight information: **10M**

Flights(fno: integer, from: string, to: string, distance: integer,

departs: time, arrives: time, price: real)

Aircraft(aid: integer, aname: string, cruisingrange: integer)

Certified(eid: integer, aid: integer)

Employees(eid: integer, ename: string, salary: integer)

a. Find the names of pilots certified for some Boeing aircraft.

b. Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras.

c. Find the eids of employees who make the highest salary.

d. Identify the flights that can be piloted by every pilot whose salary is more than \$100,000.

e. Print the name and salary of every nonpilot whose salary is more than the average salary for pilots.

Q4. From the following Salesperson table,

a. Create a view for those salespersons belong to the city 'New York'.
With commission greater than 0.10

5M

salesman_id	name	city	commission
5001	James Hoog	New York	0 .15
5002	Nail Knite	Paris	0 .13
5005	Pit Alex	London	0 .11
5006	Mc Lyon	Paris	0 .14
5007	Paul Adam	Rome	0 .13
5003	Lauson Hen	San Jose	0 .12

b. Create a Trigger to update the salary of the Employees in Emp Table with 10% hike for those who have Performance rating is above 5.

5M

Q5.
a. Consider a relation R with five attributes ABCDE. You are given the following dependencies: A → B, BC → E, and ED → A.

5M

1. List all keys for R.

2. Is R in 3NF?

3. Is R in BCNF?

b. Give the importance of Normalization by converting a table from 3NF to BCNF. **5M**

QP MAPPING

Q. No.	Module Number	COMapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1,2,3	2,3,5			10
Q2	2	1,2,3	2,3,5			10
Q3	2	1,2,3	2,3,4,5			10
Q4	3	2,3	2,3,4,5			10
Q5	3	3,4	2,3,4,5			10



TEMPLATE FOR QUESTION PAPER

Name of the Examination: FAT

School	SCOPE	Course Title	DATA BASE MANAGEMENT SYSTEMS
Course Code	CSE2007	Date of exam	24-05-2022
Semester	WIN SEM 2021-22		
Slot	B2+TB2		
Duration	120 minutes	Total Marks	60

(MARKS ARE MENTIONED IN SQUARE BRACKET)

Q1. Consider that the data-file has 850000 records of employees.

The employee-records are ordered based on non-key field dept_no (i.e., department number) and size of that field is 6 bytes. Each of the employee records has size of 120 bytes. Consider none of the records are allowed to cross block boundaries. Consider clustering index structure for the data file has been created to speed up the retrieval of the records where indexing field is based on the dept_no and a block pointer which is 6 bytes long. Assume the Block size is 10 Kilobytes. Consider, there are 50 employees working in each of the department. Suppose, there is a multilevel index created upon this said scenario. How many block accesses will be needed to access a record from the data file by searching the multilevel index? [12]

Q2. a. Explain the utility of view level. What is Data Abstraction in DBMS? [6]

b. Consider a relational schema R(A, B, C, D, E, F) with a set of functional dependencies F.

$$F: \{ABC \rightarrow D\}$$

$$ABD \rightarrow E$$

$$CD \rightarrow F$$

$$CDF \rightarrow B$$

.BF \rightarrow D}, Determine the candidate keys of R. [6]

Q3. Suppose you want to construct a B-tree of order p on a search key of 6 bytes long. If the size of disk block is 1024 bytes, the size of record (data) pointer is 8 bytes, and the size of block pointer is 6 bytes. what is the order p of the B tree? Show level wise number of nodes needed for a 3 level B tree starting from root level (i.e., level-0, 1, and 2). [12]

Q4. a. If the system crashes during an ongoing transaction, then how does the recovery manager restore the previous state of the database? Explain with an example. [6]

b. What is shadow paging in DBMS? Enumerate its advantages and disadvantages. [6]

Q5. a. Check whether the schedule S is conflict serializable or not (using serializability graph) and also find whether the same schedule S is recoverable or not (put justification against your answer)? [4+3]

S	T ₁	T ₂	T ₃
	W(X)		
	R(B)		
		W(B)	
		Commit();	
			R(X)
			R(B)
			W(B)
			Commit();
Commit();			

b. What do you mean by Isolation under ACID property in Transaction? What will be the equivalent serial schedule/s for the below schedule S executing three transactions T₁, T₂, and T₃ concurrently? [2+3]

S	T ₁	T ₂	T ₃
	W(X)		
	R(X)		
		W(B)	
			W(B)
			W(X)

QP Mapping

Q.No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	6	6	PO1, PO3, PO5			12
Q2	1,3	1,3	PO1, PO4, PO2, PO3			12
Q3	6	6	PO1, PO3, PO5			12
Q4	5	5	PO1, PO5			12
Q5	5	5	PO1, PO5			12

TEMPLATE FOR QUESTION PAPER

Name of the Examination: FAT

School	SCOPE		
Course Code	CSE2007		
Semester	WIN SEM 2021- 22		
Slot	B1+T1		
Duration	120 minutes	Total Marks	60

ANSWER ALL THE QUESTIONS

(MARKS ARE MENTIONED IN SQUARE BRACKET)

Q1. Consider that the data-file has 860000 records of employees. The secondary key of the records is emp_id which is also a non-ordering field and size of that field is 6 bytes. Each of the employee records has size of 110 bytes. Consider none of the records are allowed to cross block boundaries. Suppose that a secondary index has been constructed on that nonordering secondary key field emp_id of the data-file. Consider block pointer is 5 bytes long and the block size is 6 Kilobytes. Find out the total number of block accesses to search for an employee record using the said index. [12]

Q2. a. What are the responsibilities of a DBA in the three levels of the DBMS architecture? Explain with an example. [6]

b. Consider a relational schema R (A, B, C, D, E) with the following set of functional dependencies.

$$F: \{ A \rightarrow B,$$

$$AB \rightarrow C,$$

$D \rightarrow ACE \}$, Find the minimal cover of R. [6]

Q3. a. A file has $r=300,000$ STUDENT records of fixed-length. Each record has the following fields: FIRST_NAME (30 bytes), LAST_NAME (30 bytes), ADDRESS (40 bytes), MOBILE (12 bytes), BIRTHDATE (8 bytes), GENDER (1 byte), DEPARTMENTCODE (3 bytes), and PROGRAM (4 bytes). The file is stored on the disk with block size B=1024 bytes.

- i. Calculate the record size R in bytes. [3]
- ii. Calculate the blocking factor bfr and the number of file blocks required for storing the entire number of records, assuming an unspanned organization. [3]

b. Calculate average access time to access a record if the records are organized in: (i) unsorted manner (ii) sorted manner. [3]

c. What is the difference between B-tree and B⁺ tree? Explain with diagrams. [3]

Q4. a. Consider the following log consisting transactions T1, T2, and T3:

1. (Start, T1);
2. (Write, T1, P, 500, 600);
3. (Write, T1, Q, 400, 500);
4. (Commit, T1);

- 5. (Start, T2);
- 6. (Write, T2, P, 600, 550);
- 7. (Write, T2, Q, 500, 450);
- 8. (Commit, T2);
- 9. (Start, T3);
- 10. (Write, T3, P, 550, 600);
- 11. (Write, T3, Q, 450, 500);
- 12. (Commit, T3);

If the schedule crashes just after step 11, then what will be the order of undo and redo actions, performed during the recovery process? [6]

- b. Citing a suitable example, differentiate between deferred and immediate database modification techniques. [6]

- Q5. a. Check whether the schedule S is conflict serializable or not (using serializability graph) and also find whether the same schedule S is recoverable or not (put justification against your answer)? [4+3]

S	T ₁	T ₂	T ₃
R(X)			
R(B)		W(B)	
		Commit();	
			W(X)
			W(B)
			Commit();
			Commit();

- b. What do you mean by 'Consistency' under ACID property in Transaction? What will be the equivalent serial schedule/s for the below schedule S executing three transactions T₁, T₂ and T₃ concurrently? [2+3]

S	T ₁	T ₂	T ₃
R(X)		W(X)	
		W(B)	
W(X)		R(B)	

QP Mapping

Q.No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	6	6	PO1, PO3, PO5			12
Q2	1,3	1, 3	PO1, PO4, PO2, PO3			12
Q3	6	6	PO1, PO3, PO5			12
Q4	5	5	PO1, PO5			12
Q5	5	5	PO1, PO5			12



Name of the Examination: FAT

Class ID: AP2021225000194

School	Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	WIN 2021-22	Date of exam	26.05.2022
Slot	D1+TD1		
Duration	120 Minutes	Total Marks	60
Q1	<p>a) Explain the importance of relationship in the RDBMS. (3)</p> <p>b) What is empty state? (3)</p> <p>c) A relational Schema R(A,B,C,D) with FD={B→A, AD→C, C→ABD}; Find the canonical cover? (6)</p>		
Q2	<p>Explain the recovery strategy for immediate update (6)</p> <p>There are two transactions as $T_1=\{R(x), R(y), W(x), W(y)\}$ and $T_2=\{R(z), R(y), W(z), W(y)\}$.</p> <p>Find the problem in schedule $S=\{R_1(x), R_2(z), R_2(y), R_1(y), W_1(x), W_2(z), W_1(y), W_2(y), C_1, C_2\}$ (6)</p>		
Q3	<p>Four transactions $T_1=\{\text{Read}(a), \text{Write}(a), \text{Read}(c), \text{Write}(c)\}$; $T_2=\{\text{Read}(d), \text{Read}(c), \text{Write}(d), \text{Read}(a)\}$; $T_3=\{\text{Read}(c), \text{Read}(d), \text{Write}(d), \text{Read}(b), \text{Write}(c), \text{Write}(b)\}$; $T_4=\{\text{Read}(b), \text{Write}(b), \text{Read}(d), \text{Write}(d)\}$ are submitted at same time and schedule S is made as $(R_1(a), W_1(a), R_2(d), R_2(c), R_1(c), W_1(c), R_3(c), R_3(d), W_3(d), R_4(b), W_4(b), R_3(b), W_3(c), W_3(b), W_2(d), R_2(a), W_2(a), R_4(d), W_4(d))$</p> <p>Find the schedule S is serializable or not.</p>		
Q4	<p>a) Find the difference between fixed-length and variable length records. (3)</p> <p>b) You have created a table ABC using schema (ID number, Name varchar2(20), age number, city varchar2(10), salary number).</p> <ol style="list-style-type: none"> Find the maximum record size of the tuple in ABC table. (3) Find the space required on HDD to store ABC table. If ABC have 7 fixed size records. (2) Find the space required on HDD to store ABC table. If ABC have (31, john B Smith, 23, Delhi, 10000), (34, Franklin T Wong, 24, Mumbai, 12000), (35, Alicia J Zelaya, 25, Madras, 11000), (36, Ramesh K Narayan, 26, Kolkata, 11500) data. (4) 		
Q5	<p>a) Write the working of Primary indexing strategy. (4)</p> <p>b) Table T has 50000 records with record length 88byte, block size is 2048byte. Make a comparative study for linear search on the file records with fixed size and un-spanned allocation with primary indexing and without indexing. (8)</p>		

TEMPLATE FOR QUESTION PAPER

Name of the Examination: FAT

School	SCOPE	Course Code	Course Title	DATA BASE MANAGEMENT SYSTEMS
Semester	WIN SEM 2021-22	Date of exam	26-05-2022	
Slot	D2+TD2			
Duration	120 minutes	Total Marks	60	

**ANSWER ALL THE QUESTIONS
(MARKS ARE MENTIONED IN SQUARE BRACKET)**

Q1. Consider that the data-file has 720000 records of students. The primary key of the records is registration_no and size of that field is 6 bytes. Each of the students' records has size of 100 bytes. Consider none of the records are allowed to cross block boundaries. Records are ordered based on primary key. Consider primary index structure for the data file has been created where indexing field is based on the registration_no and a block pointer is 4 bytes long. Assume the Block size is 5 Kilobytes. Find out the total number of block accesses to search for a student record using the said index. Suppose, there is a multilevel index created upon this said scenario. How many block accesses will be needed to access a record from the data file by searching the multilevel index? [12]

Q2. a. What is logical database independence? How is it different from physical data independence? [6]

b. Consider a relational schema R (S, T, U, V, W, X, Y) with the following set of functional dependencies as stated below:

$$F: \{ SV \rightarrow X, \\ SW \rightarrow Y, \\ VX \rightarrow TU, \\ W \rightarrow U, \\ Y \rightarrow W \}$$

In this example, which of the below given functional dependencies are in the attribute closure of F? [6]

- Y \rightarrow U
 - S \rightarrow Y
 - SVX \rightarrow W
 - SVU \rightarrow T
 - SYX \rightarrow W
- Q3.** Consider a B⁺ tree in which the search key is 10 bytes long, block size is 1024 bytes long, record (data) pointer is 10 bytes long, and block pointer is 8 bytes long. Find out the order of the internal and the leaf nodes. Where will be the record pointers reside in such kind of tree? [12]

- Q4.** a. Can we apply the undo and redo operations in any arbitrary order? Will it violate the consistency property of the database? Explain your answer. [6]
- b. Consider the following log sequence of two transactions operating on variables A and B

respectively.

1. T1 start
 2. T1 A old =12000 new =10000
 3. T1 B old =0 new =2000
 4. T1 commit
 5. T2 start
 6. T2 A old =10000 new =10500
 7. T2 commit
- Suppose the database system crashes just before log record 7 is written. In this regard, shall the recovery manager still need to redo log records 2 and 3 because transaction T1 is already committed? Explain your answer. [6]
- Q5. a.** Check whether the schedule S is conflict serializable or not (using serializability graph) and also find whether the same schedule S is recoverable or not (put justification against your answer)? [4+3]
- | | T ₁ | T ₂ | S |
|-----------|----------------|----------------|----------------|
| | | | T ₃ |
| R(B) | | R(X) | |
| | | W(B) | |
| | | Commit(); | |
| R(B) | | | W(X) |
| | | | W(B) |
| Commit(); | | | Commit(); |
- b. What do you mean by Lost Update problem in Transaction? What will be the equivalent serial schedule/s for the below schedule S executing three transactions T₁, T₂, and T₃ concurrently? [2+3]
- | S | T ₁ | T ₂ | T ₃ |
|------|----------------|----------------|----------------|
| R(X) | | W(X) | |
| | | W(B) | |
| W(X) | | | R(B) |
- QP Mapping
- | Q. No. | Module Number | CO Mapped | PO Mapped | PEO Mapped | PSO Mapped | Marks |
|--------|---------------|-----------|--------------------|------------|------------|-------|
| Q1 | 6 | 6 | PO1, PO3, PO5 | | | 12 |
| Q2 | 1,3 | 1, 3 | PO1, PO4, PO2, PO3 | | | 12 |
| Q3 | 6 | 6 | PO1, PO3, PO5 | | | 12 |
| Q4 | 5 | 5 | PO1, PO5 | | | 12 |
| Q5 | 5 | 5 | PO1, PO5 | | | 12 |

QUESTION PAPER

Name of the Examination: FAT (Winter 2021-2022)

Course Code: CSE2007

Course Title: Database Management Systems
Date of Exam: 27.05.2022
Total Marks: 60

Slot: E2 + TE2

Duration: 120 min

Q1. A) Airline reservation systems (ARS) are systems that allow an airline to sell their inventory (seats). It contains information on schedules and fares and contains a database of reservations (or passenger name records) and of tickets issued (if applicable), ARSSs are part of passenger service systems (PSS), which are applications supporting the direct contact with the passenger.

ARS eventually evolved into the computer reservations system (CRS). A computer reservation system is used for the reservations of a particular airline and interfaces with a global distribution system (GDS) which supports travel agencies and other distribution channels in making reservations for most major airlines in a single system.

If you consider booking of a flight ticket as a transaction, then explain the desirable properties for booking a ticket?

6 M

B) If a transaction is failed while execution then which state it will go, justify your answer?
 If a transaction is successfully executed and committed then which state it will go,

Justify your answer?

Q2.

Four transactions $T_1=\{\text{Read}(a), \text{Write}(a), \text{Read}(c), \text{Write}(c)\}$; $T_2=\{\text{Read}(d), \text{Read}(c), \text{Write}(d), \text{Read}(a)\}$ $T_3=\{\text{Read}(c), \text{Read}(d), \text{Write}(d), \text{Read}(b), \text{Write}(c)\}$, $T_4=\{\text{Read}(b), \text{Write}(b), \text{Read}(d), \text{Write}(d)\}$ are submitted at same time and schedule S is made as $(R_1(a), W_1(a), R_3(c), R_3(d), W_3(d), R_2(d), R_4(b), W_4(b), R_1(c), W_1(c), R_4(d), W_4(d), R_5(b), W_5(c), W_5(b), W_2(d), R_2(a), W_2(a))$

Find the schedule S is serializable or not through precedence graph and

justify your answer.

If it is serializable then find the corresponding serial schedule(s).

7 M

Q3. A) Write the working of simple cluster indexing strategy and separate block cluster indexing.

B) Table T has 80000 records with record length 50byte, block size is 2048byte. There are 3000 distinct values for indexing field and each value.

How many blocks are required to store the table using simple cluster indexing? 5 M

Q4.

A) What are the rules for construction of a B⁺ tree?

B) Create a B⁺ tree for the given data. Show every step after insertion.

Elements to be inserted in the B+ tree are 8, 5, 1, 7, 3, 12, 9, 6, 10.

5 M

7 M

Q5. A) Consider the following database table to answer the given questions

roll_no	name	dept_name	dept_building
42	abc	CO	A4
43	pqr	IT	A3
44	xyz	CO	A4
45	xyz	IT	A3
46	mno	EC	B2
47	jkl	ME	B2

State the given FD's are valid or invalid, justify your answer

i) roll_no → { name, dept_name, dept_building }
ii) name → dept_name

3 M

3 M

B) If you are given a chance to design the database of VIT-AP University, then explain the database administrator roles?

6 M

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	5	C05	PO1, PO5			12
Q2	5	C05	PO1, PO5			12
Q3	6	C06	PO1, PO3, PO5			12
Q4	6	C06	PO1, PO3, PO5			12
Q5	1,3	C01, C02	PO1, PO2, PO3, PO4			12

QUESTION PAPER

Name of the Examination: FAT (Long-Summer 2022-2023)

School	School of Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	Long-Summer	Date of exam	28.07.2022
Slot	A+TA+TAA	Faculty Name& ID	Dr. B.Naseeba (70390)
Duration	120 Mins	Total Marks	60

Q1. Consider the following information about a university database:

- Professors have an SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Analyze the above scenario and answer the following,

- Design and draw an ER Diagram that captures the information about the university. **(6 Marks)**
- Convert the ER Diagram into Relational model **(6 Marks)**

Q2.

- a) Consider the following table schema
Employee (eid, employee-name, street, city)
Works (workid, employee-name, company-name, salary)
Company (compid, company-name, city)
Manages (employee-name, manager-name)

Answer the following using Join:

- (4*1 = 4 Marks)
1. Find the names, street address, and cities of residence for all employees who work for 'First Bank Corporation' and earn more than \$10,000.
 2. Find the names of all employees in the database who live in the same cities as the companies for which they work.
 3. Find the names of all employees in the database who live in the same cities and on the same streets as do their managers.
 4. Find the names of all people work for exactly one company.
- b) Consider the following two set of functional dependencies:
 $F = \{ A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E \}$ and $G = \{ A \rightarrow BC, D \rightarrow AB \}$
Are they equivalent to one another? Justify.

Q3.

- a) Consider the following table schema

Pop (senID, Name, Continent, area, population, Gdp)

Answer the following using subquery:

- (4*1 = 4 Marks)
1. List the name and continent of countries in the continents containing 'Belize', 'Belgium'.
 2. Which country has a population that is more than Canada but less than Poland?
Show the name and the population.
 3. Find the largest country (by area) in each continent, show the continent, the name and the area:
 4. Find the continents where all countries have a population ≤ 25000000 . Then find the names of the countries associated with these continents. Show name, continent and population.

- b) Optimize the following query using heuristic query optimization. (8 Marks)

```
SELECT P.Number, P.Dnum, E.Lname, E.Address, E.Bdate FROM PROJECT AS P,DEPARTMENT AS D, EMPLOYEE AS E WHERE P.Dnum=D.Dnumber AND D.Mgrssn=E.SsnANDP.Plocation='stafford';
```

Q4.

- a) Consider the schedule $S : R_1(A), R_2(A), R_1(B), R_2(B), R_3(B), W_1(A), W_2(B)$

Check whether the given schedule is conflict-serializable or not. Explain how.

(4 Marks)

- b) Consider a database with objects X and Y and assume that there are two transactions T1 and T2. Transaction T1 reads objects X and Y and then writes object X. Transaction T2 reads objects X and Y and then writes objects X and Y.
1. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-read conflict.

- Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a read-write conflict.
 - Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-write conflict.
 - What happens to the database system throughput if the number of read-write and read-transactions is increased?
- (8 Marks)**

Q5.

- Consider a disk with a sector size of 256 bytes, 1000 tracks per surface, 30 sectors per track, five double-sided platters, and average seek time of 10 msec.
 - What is the capacity of a track in bytes? What is the capacity of each surface? What is the capacity of the disk? (6 Marks)
 - How many cylinders does the disk have?
 - Give examples of valid block sizes. Is 256 bytes a valid block size? 512? 1048? 2048?
 - If the disk platters rotate at 2800 rpm (revolutions per minute), what is the maximum rotational delay?
 - Construct a B+-tree for the following set of key values: (2, 3, 5, 7, 11, 17, 19, 23, 29, 31) Assume that the tree is initially empty and values are added in ascending order. Construct B+-trees for the cases where the number of pointers that will fit in one node is as follows:
 - Four
 - Six
 - Eight
- (6 Marks)**

QP MAPPING

Q. No.	Module Number	COMapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	2	2	2,3,5			12
Q2	3	3	2,3,5			12
Q3	4	4	2,3,4,5			12
Q4	5	5	2,3,4,5			12
Q5	6	5	2,3,4,5			12

QUESTION PAPER

Name of the Examination: FAT (Long-Summer 2022-2023)

School	School of Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	Long-Summer	Date of exam	28.07.2022
Slot	A+TA+TAA	Faculty Name& ID	Dr. B.Naseeba (70390)
Duration	120 Mins	Total Marks	60

Q1. Consider the following information about a university database:

- Professors have an SSN, a name, an age, a rank, and a research specialty.
 - Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
 - Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
 - Each project is managed by one professor (known as the project's principal investigator).
 - Each project is worked on by one or more professors (known as the project's co-investigators).
 - Professors can manage and/or work on multiple projects.
 - Each project is worked on by one or more graduate students (known as the project's research assistants).
 - When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
 - Departments have a department number, a department name, and a main office.
 - Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
 - Graduate students have one major department in which they are working on their degree.
 - Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.
- Analyze the above scenario and answer the following,

- a) Design and draw an ER Diagram that captures the information about the university.
(6 Marks)
- b) Convert the ER Diagram into Relational model
(6 Marks)

Q2.

- a) Consider the following table schema
Employee (eid, employee-name, street, city)
Works (workid, employee-name, company-name, salary)
Company (compid, company-name, city)
Manages (employee-name, manager-name)

Answer the following using Join:

1. Find the names, street address, and cities of residence for all employees who work for 'First Bank Corporation' and earn more than \$10,000.
2. Find the names of all employees in the database who live in the same cities as the companies for which they work.
3. Find the names of all employees in the database who live in the same cities and on the same streets as do their managers.
4. Find the names of all employees in the database who do not work for 'First Bank Corporation'. Assume that all people work for exactly one company.
- b) Consider the following two set of functional dependencies:
 $F = \{ A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E \}$ and $G = \{ A \rightarrow BC, D \rightarrow AB \}$
Are they equivalent to one another? Justify.

Q3.

- a) Consider the following table schema

Pop (senID, Name, Continent, area, population, Gdp)

Answer the following using subquery:

1. List the name and continent of countries in the continents containing 'Belize', 'Belgium'.
2. Which country has a population that is more than Canada but less than Poland?
Show the name and the population.
3. Find the largest country (by area) in each continent, show the continent, the name and the area:
4. Find the continents where all countries have a population ≤ 25000000 . Then find the names of the countries associated with these continents. Show name, continent and population.

- b) Optimize the following query using heuristic query optimization. **(8 Marks)**

```
SELECT P.Number, P.Dnum, E.Lname, E.Address, E.Bdate FROM PROJECT AS P,DEPARTMENT AS D, EMPLOYEE AS E WHERE P.Dnum=D.Dnumber AND D.Mgrssn=E.SsnANDP.Plocation='stafford';
```

Q4.

- a) Consider the schedule $S : R_1(A), R_2(A), R_1(B), R_2(B), R_3(B), W_1(A), W_2(B)$

Check whether the given schedule is conflict-serializable or not. Explain how.

(4 Marks)

- b) Consider a database with objects X and Y and assume that there are two transactions T1 and T2. Transaction T1 reads objects X and Y and then writes object X. Transaction T2 reads objects X and Y and then writes objects X and Y.
1. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-read conflict.

2. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a read-write conflict.
3. Give an example schedule with actions of transactions T1 and T2 on objects X and Y that results in a write-write conflict.
4. What happens to the database system throughput if the number of read-write and read-transactions is increased?

(8 Marks)

Q5.

a) Consider a disk with a sector size of 256 bytes, 1000 tracks per surface, 30 sectors per track, five double-sided platters, and average seek time of 10 msec.

1. What is the capacity of a track in bytes? What is the capacity of each surface? What is the capacity of the disk? (6 Marks)

2. How many cylinders does the disk have?

3. Give examples of valid block sizes. Is 256 bytes a valid block size? 512? 1048? 2048?

4. If the disk platters rotate at 2800 rpm (revolutions per minute), what is the maximum rotational delay?

b) Construct a B+-tree for the following set of key values: (2, 3, 5, 7, 11, 17, 19, 23, 29,

31) Assume that the tree is initially empty and values are added in ascending order. Construct B+-trees for the cases where the number of pointers that will fit in one node is as follows:

1. Four
2. Six
3. Eight

(6 Marks)

QP MAPPING

Q. No.	Module Number	COMapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	2	2	2,3,5			12
Q2	3	3	2,3,5			12
Q3	4	4	2,3,4,5			12
Q4	5	5	2,3,4,5			12
Q5	6	5	2,3,4,5			12

QUESTION PAPER

Name of the Examination: FAT (Long-Summer 2022-2023)

School	School of Computer Science and Engineering		
Course Code	CSE2007	Course Title	Database Management Systems
Semester	Long-Summer	Date of exam	29.07.2022
Slot	A+TA+TAA	Faculty Name& ID	Dr. B.Naseeba (70390)
Duration	120 Mins	Total Marks	60

Q1. Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database.

- Each musician that records at Notown has an SSN, a name, an address, and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone.
- Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.
- Each song recorded at Notown has a title and an author.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Analyze the above scenario and answer the following-(6 Marks each)

- Design and draw an ER Diagram that captures the information about the university.
- Convert the ER Diagram into Relational model

Q2. a) Consider the following table schema (4*1=4 Marks)

Employee (eid, employee-name, street, city)
 Works (workid, employee-name, company-name, salary)
 Department (compid, company-name, city)
 Manages (employee-name, manager-name)

Answer the following using Join:

- Find details of residence for all employees who work for 'New York Corporation' and earn more than \$50,000.
- Find the eid of all employees in the database who live in the same cities as the

companies for which they work.

3. Find the eid of all employees in the database who live in the same cities and on the same streets as do their managers.

4. Find the names of all employees in the database who do not work for 'New York Corporation'. Assume that all people work for exactly one company.

b) Consider the following two set of functional dependencies:

$$F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\} \text{ and } G = \{A \rightarrow CD, E \rightarrow AH\}$$

Are they equivalent to one another? Justify. (8 Marks)

Q3. a) Consider the following schema:

Suppliers(sid: integer, sname: string, address: string)

Parts(pid: integer, pname: string, color: string)

Catalog(sid: integer, pid: integer, cost: real)

Answer the following SQL query:

1. Find the names of suppliers who supply some red part.

2. Find the sids of suppliers who supply some red or green part.

3. Find the sids of suppliers who supply some red part or are at 221 Packer Street.

4. Find the sids of suppliers who supply some red part and some green part.

b) Define your own schema for the given query and Optimize the following query using heuristic query optimization. (8 Marks)

Select S.Sid, S.Date_of_Joining, C.Cid, C.coursename, E.Eid, E.department from Student AS S, Enrolled AS E, Course AS C where S.sid=E.sid, E.cid=C.cid, C.coursename="physics" belonging to CSE Department who have joined on 2020.

Q4. a) Consider the schedule $S : R_1(X), R_2(X), R_3(X), R_1(Y), R_2(Y), W_1(X), W_2(Y) W_3(Y)$. Check whether the given schedule is conflict-serializable or not. (4 Marks)

b) Consider a database with objects A and B and assume Two transactions T1 and T2.

Transaction T1 and T2 reads objects A and B and then writes objects X and Y.

Give an example schedule with actions of transactions T1 and T2 on objects A

And B that results in

1. Write-Read conflict. 2. Read-Write conflict. 3. Write-Write conflict.

4. What happens to the database system throughput if the numbers of Read-Write, Write-Read and Write-Write transactions are increased? (8 Marks)

Q5. A) Consider a disk with a sector size of 512 bytes, 2000 tracks per surface, 30 sectors per track, five double-sided platters, and average seek time of 10 msec.

1. What is the capacity of a track in bytes? What is the capacity of each surface?

What is the capacity of the disk?

2. How many cylinders does the disk have?

3. Give examples of valid block sizes. Is 256 bytes a valid block size? 512? 1048? 2048?

4. If the disk platters rotate at 2800 rpm (revolutions per minute), what is the maximum rotational delay? (6 Marks)

b) Construct a B+-tree for the following set of key values: (2, 3, 5, 7, 9, 11, 17, 19, 23, 27,

29, 31) Assume that the tree is initially empty and values are added in ascending order.

Construct B+-trees for the cases where the number of pointers that will fit in one node is as follows:

1. Three

2. Four

3. Five

(6 Marks)

QUESTION PAPER

Name of the Examination: CAT-2 (WINTER 2022-2023)

Course Code: CSE2007

Course Title: Database Management Systems

Slot: 1

Date of Exam: 03/04/2023 (FRI) (G1)

Duration: 90 Mins

Total Marks: 50

1. Given a table R(A, B, C, D, E, F, G, H, I, J) and the set of functional dependencies F($A \rightarrow C$, $ID \rightarrow EA$, $GF \rightarrow GDB$, $DH \rightarrow IJ$, $A \rightarrow BD$, $BC \rightarrow FH$, $C \rightarrow DA$, $CJ \rightarrow B$). [5+5]
 - a. Find the candidate keys of the table R.
 - b. Find the highest normal form of the relation R. Justify the answer.

2. Given the table S(A, C, E, G, I, K, M) with functional dependencies F($A \rightarrow AE$, $I \rightarrow EM$, $K \rightarrow CG$, $M \rightarrow CK$, $AE \rightarrow EI$, $IE \rightarrow M$, $C \rightarrow G$, $C \rightarrow K$, $K \rightarrow GM$, $M \rightarrow KG$). Find the canonical cover [10]
 - a. For the following relation and the given set of functional dependencies, check the equivalence of them. A relation R(A,B,C,D) having two FD sets $FD1 = \{A \rightarrow B, B \rightarrow C, A \rightarrow C\}$ and $FD2 = \{A \rightarrow B, B \rightarrow C, A \rightarrow D\}$
 - b. Given the table S(A, C, E, G, I, K, M) with functional dependencies F($A \rightarrow AE$, $I \rightarrow EM$, $K \rightarrow CG$, $M \rightarrow CK$, $AE \rightarrow EI$, $IE \rightarrow M$, $C \rightarrow G$, $C \rightarrow K$, $K \rightarrow GM$, $M \rightarrow KG$). If we decompose the table S into S1(A, E, I, M) and S2(C, G, K, M), will it be lossless or lossy decomposition. Justify the answer.

3. [5+5]
 - a. For the following relation and the given set of functional dependencies, check the equivalence of them. A relation R(A,B,C,D) having two FD sets $FD1 = \{A \rightarrow B, B \rightarrow C, A \rightarrow C\}$ and $FD2 = \{A \rightarrow B, B \rightarrow C, A \rightarrow D\}$
 - b. Given the table S(A, C, E, G, I, K, M) with functional dependencies F($A \rightarrow AE$, $I \rightarrow EM$, $K \rightarrow CG$, $M \rightarrow CK$, $AE \rightarrow EI$, $IE \rightarrow M$, $C \rightarrow G$, $C \rightarrow K$, $K \rightarrow GM$, $M \rightarrow KG$). If we decompose the table S into S1(A, E, I, M) and S2(C, G, K, M), will it be lossless or lossy decomposition. Justify the answer.

4. Given the following schema student(regno, fname, lname, did, pid), dept(did, dept_name, specialization, secretary_name, deanid), dean(deanid, dean_name) and ecproject(pid, ptitle) [2 X 5]
 - a. Write a SQL query to find the **regno**, **fname**, **lname** of the students who is studying in CSE department.
 - b. Write a SQL query to find the **first name** and the first character of the **last name** of the student.

- c. Write a SQL query to find the name of students who are studying in the ECE department with VLSI specialization.
- d. Write a SQL query to find the students name working in the project that contains the phrase, ‘Raspberry Pi’, or ‘Robot’ anywhere in the title.
- e. Find the dean’s name of the student whose regno is 123
5. Consider the schema R(a,b,c), T(f,d,e). Draw the efficient query plan and give the relational algebraic expression for the following query ***SELECT a,e,b FROM R, T WHERE R.b = T.f AND a = 'xyz' AND e = 'ijk'***. using heuristics in query optimization. [10]

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO3	PO1, PO2, PO3, PO4			10
Q2	3	CO3	PO1, PO2, PO3, PO4			10
Q3	3	CO3	PO1, PO2, PO3, PO4			10
Q4	4	CO4	PO1, PO2, PO3, PO5			10
Q5	4	CO4	PO1, PO2, PO3, PO5			10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE2007

Course Title: Database Management Systems

Set number: 2

Date of Exam: 30/03/2023 (FN) (CD)

Duration: 90Mins

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. a) Given a relation R (A,B,C,D,E,F,G,H,I,J,K) with the following functional dependencies (10M)

F:
 $A \rightarrow D$
 $AB \rightarrow C$
 $C \rightarrow A$
 $BC \rightarrow G$
 $CD \rightarrow B$
 $BE \rightarrow I$
 $CE \rightarrow F$
 $CF \rightarrow D$
 $D \rightarrow E$
 $B \rightarrow H$
 $AD \rightarrow J$
 $E \rightarrow K$
 $K \rightarrow B$

Find the closure of each of the attributes and one possible candidate key.

Q2. a) Given a relational schema R(A, B, C, D, F) set of functional dependencies P and Q such that:

$P = \{ A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow F \}$ and $Q = \{ A \rightarrow BC, D \rightarrow AF \}$ using FD sets P and Q which of the following options are correct? Justify your answer using Equivalence of FD. (5M)

- a) P is a subset of Q
- c) $P = Q$
- d) $P \neq Q$

b) Find the minimal cover of the given set of functional dependencies. (5M)

$A \rightarrow BC$
 $B \rightarrow C$
 $A \rightarrow B$
 $AB \rightarrow C$

Q3. Consider the STUDENT relation and answer the questions given below. **(10M)**

Stud. ID	Sub. ID	Marks	Instructor	Exam Type	Max. Mark	Hobby
101	S101T	65	Mr.X	Theory	70	Cricket, Football, Music,
101	S102L	20	Mr.Y	Lab	30	Cricket, Football, Music,
101	S103T	60	Mr.Z	Theory	70	Cricket, Football, Music,
102	S101T	58	Mr.X	Theory	70	Singing, Cricket, Football
102	S102L	25	Mr.Y	Lab	30	Singing, Cricket, Football
103	S102L	12	Mr.Y	Lab	30	Chess, Batminton
103	S103T	45	Mr.Z	Theory	70	Chess, Batminton
105	S101T	18	Mr.X	Theory	70	Cricket

Answer the questions given below;

- a) Is STUDENT in 2NF? If not, convert into 2NF.
- b) Is STUDENT in 3NF? If not, convert into 3NF.

Q4. Consider the relation employee schema(**Assume your own data according to the questions given below**) and write the query and sample output for the given questions. **(10M)**

Employee(employee_id, first_name, last_name, email, phone number, job_ID, salary)

- A) write a SQL query to find those employees who receive a higher salary than the employee with ID 100. Return first name, last name.
- B) write a SQL query to find those employees whose salary is lower than that of employees whose job title is 'manager'. Return employee ID, first name, last name, job ID
- C) write a SQL query to check whether there are any employees with salaries exceeding 5000. Return first name, last name and department ID
- D) write a SQL query to find all those employees who earn more than an employee whose last name is 'roger'. Sort the result in ascending order by last name. Return first name, last name and salary.

Q5. a) Explain the steps involved in query processing with suitable illustration. **(5M)**

b) Explain the need of Heuristics in query optimization. **(5M)**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4	1	1	10
Q2	3	3	1,2,3,4	1	1	10
Q3	3	3	1,2,3,4	1	1	10
Q4	4	4	1,2,3,5	1	1	10
Q5	4	4	1,2,3,5	1	1	10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE 2007

Set number: 3

Duration: 90 min

Course Title: Database Management Systems

Date of Exam: 29/03/2023 (AN) (C2)

Total Marks: 50

(Each Question carries 10 Marks)

Q1. A. The Given FD's are ($B \rightarrow A$, $AD \rightarrow BC$, $C \rightarrow ABD$). Find minimal cover of the given FD's.

(5 Marks)

B. Check the given 2 sets of FDs are equivalent or not.

$(F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD\}, \text{ and let } G = \{A \rightarrow CD, E \rightarrow AHE\})$ **(5 Marks)**

Q2. A. R (A, B, C, D), FD= $\{A \rightarrow B, B \rightarrow C, C \rightarrow D\}$, R1(AB), R2(BC), R3(CD) is lossless or lossy.

(5 Marks)

B. Consider the relation R (A,B,C,D,E,F,G,H,I,J) and the set of FD's { $AB \rightarrow C$, $A \rightarrow DE$, $B \rightarrow F$, $F \rightarrow GH$, $D \rightarrow IJ$ }. Find the key of R. Also decompose R into 2NF.

(5 Marks)

Q3.

Consider the following dependencies and the description of FINANCIAL-PLAN data item.

`CustomerId --> CustomerName, CustomerAddress`

`InvestmentId --> Type, Description`

`BranchNum --> BranchName, BranchAddress, RegionCode`

`RegionCode --> RegionName`

`CustomerId, InvestmentId, BranchNum --> Balance`

The UNF of the above relationships is described as follows:

`FINANCIAL-PLAN(CustomerId, CustomerName, CustomerAddress, (BranchNum,
BranchName, BranchAddress, RegionCode, RegionName, (InvestmentId,
Type, Description, Balance)))`

Normalize the above FINANCIAL-PLAN un normalized form to arrive at a suitable database design which satisfied the BCNF by clearly showing the stages 1NF, 2NF, 3NF AND BCNF.

(10 Marks)

Q4. Query optimization is an important step using query processing. Discuss the main goal of query optimization. Also explain how SQL processing includes parsing and execution of SQL statements.

(10 Marks)

Q5. Consider the following database scheme

Drivers (did, dname, gender, age)

Reserve (did, cid, day, cost)

Cars (cid, cname, model, color, rid)

Rental-company (rid, rname, revenue, rating)

Ismember (dis,rid, join-time, member-type)

Write the SQL queries for the following

- a. Find the name of the driver who have reserved a red car on day “02/07/2022” of model Toyota
- b. Find the name of all drivers that are member of a rental company whose rating is >65.
- c. Find the youngest driver who is a member of both company “Avis” and “Hertz”.
- d. Find the car model that is rented most frequently by drivers whose age is between 21 and 30.

(10 Marks)

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	2	3,4,5,6			10
Q2	3	2	3,4,5,7			10
Q3	3	3	3,4,5,6			10
Q4	4	4	3,4,5,7			10
Q5	4	4	3,4,5,6			10

QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE 2007

Set number: 4

Duration: 90 Min

Course Title: Database Management System

Date of Exam: 03/04/2023 (An)

Total Marks: 50 Marks (62)

Instructions:

Answer all the questions

Q1. Consider the below table (R) as a database relation to answer the following questions.

A ₁	A ₂	A ₃	A ₄	A ₅
H	P	Y	R	M
G	S	X	L	N
H	P	Y	R	O
G	T	X	R	O
G	S	X	L	M
H	T	Y	R	N

- A. Find all functional dependencies in R. (6M)
- B. Find all candidate keys present in R. (4M)

Q2. Functional dependency set F is ($A \rightarrow BC$; $B \rightarrow C$; $A \rightarrow D$).

- A. How will you derive $A \rightarrow CD$ from F? Mention the rules you are using. (3M)
- B. Write the proofs for the inference rules used in Question 2.A. (4M)
- C. Find the minimal cover of F. (3M)

Q3. A Relation A (P, Q, R, S, T) with functional dependencies F ($P \rightarrow R$; $QR \rightarrow T$; $Q \rightarrow S$; $T \rightarrow P$). Perform normalization up to BCNF on relation A. show the step wise decompositions. (10M)

Q4. Relational schema for Library management system.

Book (B_ID, B_name, Publisher, Price, Year_of_publish)

Users (U_ID, Name, Type, Joinin_date, Status)

Borrow (B_sl, B_ID, U_ID, Timestamp, Return date)

Return (R_sl, B_ID, U_ID, Timestamp, Remark)

Fine (Bill_no, U_ID, B_ID, Amount, Reason, Status)

Write the SQL query for the bellow questions. (5 X 2M=10M)

1. Find the number of status active and faculty type users in the database.
2. List the users with total fine, who have not paid status for reason late fine.
3. How many users have borrowed the costliest book from Pearson publisher?
4. List the users, who have not submitted books after due date.
5. List out the student type users submitted book with remark “cut and tear”.

Q5.

- A. Which search method will be applicable on the query {select * from Book where price>500 and Year_of_publish in (2010, 2020, 2022);} (2M)
- B. Relation R (A, B, C, D, E, F) has 1000 tuples. A query “select B, A from R where E>(select avg(E) from R)” executed. Find the efficient sequence of relational algebraic operations. (4M)
- C. Make Query Tree for the query:- “select B.B_name, U.Name, F.Amount from Book B, User U, Fine F where B.B_ID=F.B_ID and U.U_ID=F.U_ID and F.Status=“not Paid” (you can refer the relational schema in Q4 for detailed understanding.) (4M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO3	PO1, PO2, PO3, PO4			10
Q2	3	CO3	PO1, PO2, PO3, PO4			10
Q3	3	CO3	PO1, PO2, PO3, PO4			10
Q4	4	CO4	PO1, PO2, PO3, PO5			10
Q5	4	CO4	PO1, PO2, PO3, PO5			10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE2007

Course Title: Database Management system

Set number: SET- 5

Date of Exam: 30/03/2023 (An) (D2)

Duration: 90 Min

Total Marks: 50 Marks

Instructions:

1. Answer all the questions.
2. Any assumptions made should be clearly stated.
3. Read the questions carefully

5x10=50M

Q1. From the given relation schema write the appropriate SQL Queries for the below questions

customers	
Customer_Id	
First_Name	
Last_Name	
Birth_Date	
Join_Date	
City	
State	
Street	
main_phone_num	
secondary_phone_num	
fax	
monthly_discount	
pack_id	

- a. Display the customer number, first name, state, city and package number for all customers whose package id equals 21, 28, or 14 2.5M
- b. Display the number of Null values in Fax column 2.5M
- c. Display the city and the average monthly discount for each city, only for the customers whose monthly discount is greater than 20 2.5M
- d. Create a query to display unique cities and states from *Customers* table. 2.5M

Q2. Consider the following sets of functional dependencies over a relation R(A, B, C).

$$F1 = \{A \rightarrow B, B \rightarrow C\}$$

$$F2 = \{A \rightarrow B, A \rightarrow C\}$$

$$F3 = \{A \rightarrow B, AB \rightarrow C\}$$

Find the equivalence between the FD's: that is to check **F1=F2**, **F1=F3** or **F2 =F3** in the above sets of functional dependencies? Justify your observations. **10M**

Q3. Find the minimal cover of the set of functional dependencies given; **10M**

$$\{A \rightarrow C, AB \rightarrow C, C \rightarrow DI, CD \rightarrow I\}$$

Q4. a. Given R (A, B, C, D, E) With F{AB->C, A->E, A->D}

Define the requirements of 2NF. Check whether the schema given is in 2NF. If not then design the new schema which follows the requirements of 2NF. **5M**

b. A relation R (C, S, J, D, P, Q, V) with following set of FDs: **5M**

$$C \rightarrow CSJDPQV, SD \rightarrow P, JP \rightarrow C, J \rightarrow S$$

This is decomposed as R1(C, J, D, Q, V), R2(J, S), R3(S, D, P). Find whether it is a lossless or lossy decomposition.

Q5. a. Describe the Process for heuristics optimization. **5M**

b. Given this database schema: **5M**

- Product (pid, name, price)
- Purchase (pid, cid, store)
- Customer (cid, name, city)

Draw the logical query plan for the below SQL query.

SELECT DISTINCT x.store FROM Purchase x, Customer y WHERE x.cid = y.cid and y.city = 'Seattle'

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	4	CO3	PO1, PO2, PO3, PO5			10
Q2	3	CO3	PO1, PO2, PO3, PO4			10
Q3	3	CO3	PO1, PO2, PO3, PO4			10
Q4	3	CO4	PO1, PO2, PO3, PO4			10
Q5	4	CO4	PO1, PO2, PO3, PO5			10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE2007

Course Title: Database Management Systems

Set number: 6

Date of Exam: 29/03/2023 (PN) (C1)

Duration: 90 Minutes

Total Marks: 50 M

Instructions:

1. Use correct notations wherever applicable.
2. Use SQL script wherever required.

Q1. With the table given below, show if the following 1. Insertion 2. Deletion and 3. Updation Anomalies exist or not. If it exists, explain and then give your solution to eliminate it. (10 Marks)

Assignment_Department					
AsgCode	AsgName	AsgManager	AsgBudget	DeptNo	DeptName
PC10	Pension	Shekar	24500	L004	IT
PC10	Pension	Shekar	24500	L023	HR
PC45	Salary	Venu Gopal	17400	L004	IT
PC10	Pension	Shekar	24500	L003	Admin

Q2.

- Consider the following two sets of functional dependencies
 $F1 = \{ A \rightarrow C, AB \rightarrow C, C \rightarrow DK, CD \rightarrow K \}$ and $F2 = \{ A \rightarrow CD, D \rightarrow K \}$.
Find if $F1$ is equivalent to $F2$? (5 Marks)
- A relation $R(A, C, D, E, H)$ satisfies the following FDs:
 $\{ A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H \}$.
Find the canonical cover for this set of FDs. (5 Marks)

Q3. Consider the following relation Warehouse_Customer. Check if the relation is normalized? If it is not normalized, identify the functional dependencies present and normalize it up to third normal form. (10 Marks)

WareHNo	WareHLoc	SPld	SPName	CustID	CustName	CustAddr	SAmt	Ddate
W10	Guntur	SP4	Kiran	C101	Neela	Thenali	3000	7-12-2022
W10	Guntur	SP4	Kiran	C102	Hema	Tadepalle	2000	19-10-2022
W19	Kothuru	SP5	Sirisha	C103	Tarun	Thenali	4000	5-01-2023
W19	Kothuru	SP5	Sirisha	C104	SaiKumar	Vemavaram	2500	16-02-2023

Q4. Consider the relations given and convert the given queries into SQL scripts. (10 Marks)

Country		
<u>CCode</u>	CName	CPopulation
101	India	9
102	Oman	2
103	Srilanka	5
104	UAE	6

Customer				
<u>CustId</u>	CustName	<u>CCode</u>	CustGender	CustPur
1001	Trisha	102	M	10000
1002	Raghav	101	F	40000
1003	Chaitra	103	F	30000
1004	Ester	101	F	25000

- a. Retrieve all details of customers whose name starts with 'T'. (2 Marks)
- b. Get the country name, customer Id, customer name and gender of customers. (2 Marks)
- c. Get all customers who have purchased for more than 20000 and belonging to India. (2 Marks)
- d. Display country code, country name and its population in descending order. (2 Marks)
- e. Delete all the customers from "Srilanka". (2 Marks)

Q5. Apply Heuristic Query Optimization to optimize the given query. Show all the five steps explicitly with supporting query tree. (10 Marks)

Query: SELECT C.CNAME, CC.CUSTNAME, CC.CUSTPUR
 FROM COUNTRY C, CUSTOMER CC
 WHERE CC.CUSTPUR >= 30000 AND C.CNAME = "INDIA" AND C.CCODE = CC.CCODE;

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	CO3	PO1,PO2,PO3,PO4	-	-	10
Q2	3	CO3	PO1,PO2,PO3,PO4	-	-	10
Q3	3	CO3	PO1,PO2,PO3,PO4	-	-	10
Q4	4	CO4	PO1,PO2,PO3,PO5	-	-	10
Q5	4	CO4	PO1,PO2,PO3,PO5	-	-	10

QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: CSE 2007

Course Title: Data Base Management Systems

Set number: 9

Date of Exam: 28/03/2023 (Fn) (B1)

Duration: 90 Min

Total Marks: 50 Marks

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. What is BCNF? What is the motivation for creating a relation in BCNF? What is the motivation for 3NF? In what way 3NF is different from BCNF, explain with suitable example and show the required decompositions. (10M)

Q2. Consider the table given below consists of the patient details about dental appointments.

- i) It is susceptible to update anomalies. Discuss the insertion, deletion and modification anomalies which are present in the given table. (5M)

State any assumptions you make about the data shown in this table.

staffNo	dentistName	patientNo	patientName	appointment date	time	surgeryNo
S1011	Tony Smith	P100	Gillian White	12-Aug-03	10.00	S10
S1011	Tony Smith	P105	Jill Bell	13-Aug-03	12.00	S15
S1024	Helen Pearson	P108	Ian MacKay	12-Sept-03	10.00	S10
S1024	Helen Pearson	P108	Ian MacKay	14-Sept-03	10.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Oct-03	16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Oct-03	18.00	S13

ii) For a given Relation R(A, B, C, D, E, F). The functional dependencies are {AB->C, BC->AD, D->E, CF->B}. Find the closure and all candidate keys? (5M)

Q3. Let the relation R(A,B,C,D,E,G) and Functional dependencies F={ AB->C, AC->B, AD->E, B->D, BC->A, E->G } is decomposed into three relations R1(A,B,C) , R2(A,C,D,E) and R3(A,D,G).Find, Is it lossy or lossless decomposition. (10M)

Q4. For the relational schema:

Emp(eid: integer, ename: string, age: integer, salary: real)

Works(eid: integer, did: integer, pctime: integer)

`Dept(did: integer, dname: string, budget: real, managerid: integer)`

Answer the following:

(10M)

- i) Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple?
- ii) Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints.
- iii) Find the name of each employee whose salary exceeds the budget of all of the departments that he or she works in.
- iv) Find the managerids of managers who manage only departments with budgets greater than \$1 million.

Q5. Consider a relational database about hotels, customers (guests) and their bookings that are maintained by an online hotel booking company. Consider the following schema. (10M)

`Hotel (hid, hName, hAddress, hCity)`

`Guest(gId, gName, gAddress, gCity)`

`Room(hid, roomNo, type, price)`

`Booking(gId, hid, roomNo, fromDate, year, noOfDays)`

Write SQL query, relational algebra expression, query optimization process that returns the “**Ids of the guests who have booked at least one room of type “suite” in every hotel located in Mumbai**”.

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	2	1	2	1	10
Q2	3	1	1	2	1	10
Q3	3	2	1	2	1	10
Q4	4	2	4	-	1	10
Q5	4	2	4	-	1	10

QUESTION PAPER

Name of the Examination: WINTER 2022-2023-CAT-2

Course Code: CSE2007

Course Title: Database Management Systems

Set number: 10

Date of Exam: 31/03/2023 (An) (E₂)

Duration: 90 Minutes

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. Consider the relation scheme R(E, F, G, H, I, J, K, L, M, N) and the set of functional dependencies-

$$FD: (\{E, F\} \rightarrow \{G}, \{F\} \rightarrow \{I, J}, \{E, H\} \rightarrow \{K, L}, \{K\} \rightarrow \{M\}, \{L\} \rightarrow \{N\})$$

Find the candidate keys and super keys with stepwise procedure. **(10M)**

Q2. Given a relational schema R(X, Y, Z) set of functional dependencies P and Q such that: $P = \{X \rightarrow Y, Y \rightarrow Z, Z \rightarrow X\}$ and $Q = \{X \rightarrow YZ, Y \rightarrow X, Z \rightarrow X\}$

Check whether P and Q are equivalent or not? Justify. **(10M)**

Q3.a. Consider a relation R with five attributes ABCDE. You are given the following dependencies: $A \rightarrow B$, $BC \rightarrow E$, and $ED \rightarrow A$. **(5M)**

Is R in BCNF?

b. Give the importance of Normalization by converting a table from 3NF to BCNF. Explain the properties of Decomposition? **(5M)**

Q4. The following relations keep track of airline flight information:

Movie(mTitle, mYear, length, genre, studioName, producer)

MovieStar(starName, address, gender, birthyear)

StarsIn(mTitle, mYear, starName)

MovieExec(name, address, CERT, netWorth)

Studio(studioName, address, producer)

Assume the necessary data for all the relations.

Write the SQL Queries for the following

(2X5 = 10M)

- a. Display the Title of movies from with the starname as "Arjun" and birthyear as 2000.
- b. Display the names of movies which have netWorth greater than 10 lakh.
- c. Display the MovieStar name who have done movies in year 2003.
- d. Display the list of movies produced by "Michael".
- e. Display the producer of the movie "ABCD" in the year 2020.

Q5. Consider the following relational schema and SQL query. The schema captures information about employees, departments, and company finances (organized on a per department basis).

Emp(eid: integer, did: integer, sal: integer, hobby: char(20))
Dept(did: integer, dname: char(20), floor: integer, phone: char(10))
Finance(did: integer, budget: real, sales: real, expenses: real)

Consider the following query:

```
SELECT D.dname, F.budget  
FROM Emp E, Dept D, Finance F  
WHERE E.did=D.did AND D.did=F.did AND D.floor=1  
AND E.sal ≥ 59000 AND E.hobby = 'modelling'
```

- a. Convert the given SQL Query to Relational Algebra (3M)
- b. Optimize the Relational Algebra Query to generate the Canonical Query Tree. (7M)

QP MAPPING

Q. No.	Module Number	COMapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4	2	1	10
Q2	3	3	1,2,3,4	2	1	10
Q3	3	3	1,2,3,4	2	1	10
Q4	4	4	1,2,3,4	2	1	10
Q5	4	4	1,2,3,4	2	1	10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE2007

Course Title: Database Management System

Set number: 11

Date of Exam: 28/03/2023 (An) (B₂)

Duration: 90 Minutes

Total Marks: 50

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. a. Consider a relational schema R(P Q R S) is associated with the following two sets of functional dependencies:

$$F_1: \{P \rightarrow Q, Q \rightarrow R, R \rightarrow S\}$$

$$F_2: \{P \rightarrow QR, R \rightarrow S\}$$

Check if F1 and F2 are equivalent. (5M)

b. Consider a relational schema R(W X Y Z) is associated with the following set of functional dependencies:

$$F: \{X \rightarrow W, WZ \rightarrow XY, Y \rightarrow WXZ\}$$

Find the canonical cover of F. (5M)

Q2. a. Consider a relational schema R(V W X Y Z) is associated with the following set of functional dependencies:

$$F: \{X \rightarrow YV, Y \rightarrow Z, Z \rightarrow Y, VW \rightarrow X\}$$

Find the highest normal form satisfied by R. Substantiate the answer with an explanation. (5M)

b. Consider a relational schema R(A B C D E F G) is associated with the following set of functional dependencies:

$$F: \{A \rightarrow BC, C \rightarrow DE, F \rightarrow G\}$$

If R is decomposed into R1(A B C), R2(C D E), R3(F G), and R4(A F) respectively, then will it be a lossless decomposition? Explain your answer. (5M)

Q3. a. Consider a relational schema R(A B C D E) is associated with the following set of functional dependencies:

$$F: \{AB \rightarrow CD, D \rightarrow E, A \rightarrow C, B \rightarrow D\}$$

Decompose R till BCNF criteria are satisfied. (5M)

b. Consider a relational schema R(A B C D E) is associated with the following set of functional dependencies:

$$F: \{CE \rightarrow D, D \rightarrow B, C \rightarrow A\}$$

Find the candidate key(s) and calculate the maximum number of super keys that can be derived from the candidate key(s). (5M)

Q4. Consider the following set of schemas and write SQL queries to accomplish the below given tasks. (10M)

Each query contains equal marks.

Supplier(SID, Sname, Address)

Part(PID, Pname, Color)

Catalog(SID, PID, Cost)

(i) Find the names of the suppliers who supply some red parts.

(ii) Find the identities of the suppliers who supply some red or green parts.

(iii) Find the identities of the suppliers who supply some red parts or live at Benz Circle.

(iv) Find the identities of the parts that are supplied by at least two different suppliers.

Q5. a. Consider the following set of schemas:

Branch(BID, Bcity, Asset)

Customer(CID, Cname, Ccity)

Account(Number, Balance, BID)

Depositor(CID, Number)

Draw an optimal query tree to list the customer identities who have an account in any branch located in Hyderabad and account balance is more than Rs. 10,000/-.

(5M)

b. What is the need for query processing? Define the basic steps involved in query processing. (5M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4	-	-	10
Q2	3	3	1,2,3,4	-	-	10
Q3	3	3	1,2,3,4	-	-	10
Q4	4	4	1,2,3,5	-	-	10
Q5	4	4	1,2,3,5	-	-	10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE 2007

Course Title: Database Management Systems

Set number: 12

Date of Exam: 31/03/2023

Duration: 90 min

Total Marks: 50 (PN) (EI)

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

- Q1.** a. Explain Functional dependency with example. **4M**
b. Write the procedure to find candidate keys in the given relation. **6M**

R (A, B, C, D)

FD: {A->B, BC->D, E->C, D->A}

- Q2** a. Define Normalization and explain the importance of Normalization. **4M**
b. Find whether the given relation is in 2NF, 3NF and BCNF if not do Normalization. **6M**

R(A,B,C,D,E)

FD: {A->BCDE, BC->ACE, D->E}

- Q3** a. Given a relational schema R (A, B, C, D) and set of Functional dependencies X and Y as
 $X=\{AB\rightarrow CD, B\rightarrow C, C\rightarrow D\}$ and $Y=\{AB\rightarrow C, AB\rightarrow D, C\rightarrow D\}$.
Check if X and Y are equivalent or not. **5M**
- b. Let a relation R (A, B, C, D) and functional dependency $\{AB \rightarrow C, C \rightarrow D, D \rightarrow A\}$.
Relation R is decomposed into R1(A, B, C) and R2(C, D). Check whether decomposition
is dependency preserving or not. **5M**

Q4. Consider the table in a relational database with columns and rows as follows: **10M**

Cust_ID	Name	City	Postal Code	Country
1	Alfreds	Berlin	12209	Germany
2	Ana Trujillo	México	05021	Mexico
3	Antonio	México	05023	Mexico
4	snabbköp	London	WA1 1DP	UK
5	Berglunds	Luleå	S-958 22	Sweden

Apply SQL queries and solve the given questions. Write the table for every operation.

- a. A new student information (6,'Cardinal', 'Stavanger', '4006', 'Norway') is added.
- b. List the number of different customer countries.
- c. Change the city and country of customer with customer id 2.
- d. Display customers from the country "Mexico", in the given table.
- e. Display customers from the "Customers" table, sorted by the "Country" column.

Q5. a. Explain the steps involved in processing a query. **5M**
 b. Define Query Optimization and explain heuristic query optimization. **5M**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4			10
Q2	3	3	1,2,3,4			10
Q3	3	3	1,2,3,4			10
Q4	4	4	1,2,3,5			10
Q5	4	4	1,2,3,5			10



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1/CAT-2

Course Code: CSE2007

Course Title: Database Management Systems

Set number: 13.

Duration: 90mins

Date of Exam: 27/03/2023 (FN) (A1)
Total Marks: 50M

Q1. Consider the relation scheme R(X, Y, Z, W) and set of Functional Dependency

$FD = \{ X \rightarrow Y, Y \rightarrow Z, Z \rightarrow X \}$ on R. Identify the candidate and super keys for R?

(10M)

Q2. What do you mean by equivalence of sets? Let $F1 = \{ A \rightarrow C, AC \rightarrow D, E \rightarrow AD \}$ and

$F2 = \{ A \rightarrow CD, E \rightarrow AH \}$. Justify whether F1 and F2 are equivalent?

(10M)

Q3. Normalize the following table. Show all work and clearly indicate the primary key and foreign key. R(elevator_no, building_no, building_name, capacity, staff_no, first_name, last_name, date_examined) with the following functional dependencies:

- $elevator_no \rightarrow building_no, capacity$
- $building_no \rightarrow building_name$
- $staff_no \rightarrow first_name, last_name$
- $elevator_no, staff_no \rightarrow date_examined$

Normalize table R up to BCNF.

(10M)

Q4. Use the below table and answer the following queries

Worker Table					
WORKER_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
1	Monika	Arora	1000000	20/02/14 9:00	HR
2	Niharika	Verma	80000	11/06/14 9:00	Admin
3	Vishal	Singhal	300000	20/02/14 9:00	HR
4	Amitabh	Singh	500000	20/02/14 9:00	Admin
5	Vivek	Bhati	500000	11/06/14 9:00	Admin
6	Vipul	Diwan	200000	11/06/14 9:00	Account
7	Satish	Kumar	75000	20/01/14 9:00	Account
8	Geetika	Chauhan	90000	11/04/14 9:00	Admin

Bonus Table

WORKER_REF_ID	BONUS_DATE	BONUS_AMOUNT
1	20/02/16 0:00	5000
2	11/06/16 0:00	3000
3	20/02/16 0:00	4000
1	20/02/16 0:00	4500
2	11/06/16 0:00	3500

Title Table

WORKER_REF_ID	WORKER_TITLE	AFFECTED_FROM
1	Manager	20/02/16 0:00
2	Executive	11/06/16 0:00
8	Executive	11/06/16 0:00
5	Manager	11/06/16 0:00
4	Asst. Manager	11/06/16 0:00
7	Executive	11/06/16 0:00
6	Lead	11/06/16 0:00
3	Lead	11/06/16 0:00

- a) Write an SQL query to fetch the departments that have less than five people in it
- b) Write an SQL query to show one row twice in results from a table
- c) Write an SQL query to fetch three max salaries from a table.
- d) Write an SQL query to fetch departments along with the total salaries paid for each of them.
- e) Write an SQL query to fetch the names of workers who earn the highest salary (2 x 5=10M)

Q5. Consider the following query:

```
SELECT EName From Employee, WorksOn, Project Where ProjName = 'Growth' AND
ProjNo = P-No AND EID = E-ID AND DOB > '31-12-1970';
```

Transform the above query into relational algebra and apply heuristic query optimization.

Use the data from below relations:

- Employee (EName, EID, DOB, EAdd, Sex, ESalary, EDeptNo)
- Department (DeptNo, DeptName, DeptMgrID, Mgr_S_date) DeptLoc (DeptNo, Dept_Loc)
- Project (ProjName, ProjNo, ProjLoc, ProjDeptNo)
- WorksOn (E-ID, P-No, Hours)
- Dependent (E-ID, DependName, Sex, DDOB, Relation)

(10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1, 2,3,4	2	1	10
Q2	3	3	1, 2,3,4	2	1	10
Q3	3	3	1, 2,3,4	2	1	10
Q4	4	4	1, 2,3,5	2	1	10
Q5	4	4	1, 2,3,5	2	1	10

QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-2

Course Code: CSE2007

Course Title: Database Management System

Set number: 14.

Date of Exam: 27/03/2023

Duration: 90 min

Total Marks: 50 (**A_n**) (**A₂**)

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. a) What is normalization? Why it is needed? Explain 1NF, 2NF, 3NF and BCNF. (5M)

b) Find the minimal cover for given FD set $F = \{AB \rightarrow C, D \rightarrow E, AB \rightarrow E, E \rightarrow C\}$ (5M)

Q2. a) What is dependency preservation property for decomposition? Explain why it is important. (5M)

b) Let R (A, B, C, D) be a relational schema with the following functional dependencies:

$F = \{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow B\}$. R is decomposed into R1(A, B), R2(B, C) and R3(B, D). Is the decomposition lossless and dependency preserving. Justify. (5M)

Q3. Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $G = \{\{A, B\} \rightarrow \{C\}, \{B, D\} \rightarrow \{E, F\}, \{A, D\} \rightarrow \{G, H\}, \{A\} \rightarrow \{I\}, \{H\} \rightarrow \{J\}\}$. Determine the keys of R. Decompose R into 2NF and then 3NF relations. (10M)

Q4. Consider the three DB tables as:

Instructor (dept_name, instructor_ID),

Teaches (Subject, instructor_ID, year, course_ID) and

Course (Title, course_ID). Represent the following query into an expression tree first then optimize it. Show the intermediate steps of optimization using expression tree.

$\prod_{name, title} (\sigma_{dept_name="Music" \text{ AND } year=2009}(\text{instructor} \bowtie (\text{teaches} \bowtie \prod_{course_id, title} (\text{course}))))$ (10M)

Q5. Write SQL statements for the following: Salesman (salesman_id, name, city, comission)

Customer (customer_id, customer_name, city, grade, salesman_id)

Order (order_no, purchase_amount, order_date, customer_id, salesman_id)

- i) Display all the customers, who are either belongs to the city New York or not had a grade above 100.
- ii) Find those salesmen with all information who gets the commission within a range of 0.12 and 0.14.
- iii) Display all the orders which values are greater than the average order value for 27th March 2023.
- iv) Find the highest purchase amount ordered by the each customer on a particular date with their ID, order date and highest purchase amount.
- v) Display all those orders by the customers not located in the same cities where their salesmen live. (10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	3	3	1,2,3,4	1	1,3	10
Q2	3	3	1,2,3,4	1	1,3	10
Q3	3	3	1,2,3,4	1	2	10
Q4	4	4	1,2,3,5	1	2	10
Q5	4	4	1,2,3,5	2	1,2	10