

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021**OPERATING SYSTEM**

Time: 3 hrs

Max. Marks :100

Instructions : 1. Answer any five full questions.**L CO PO M**

1a. What is the need of an operating system ? Explain the four components of a computer system with a neat diagram. [2] [1] [1] [6]

1b. Define system call ,explain different types of system calls with 2 examples for each. [2] [1] [1] [8]

1c. Explain any 6 features of UNIX Operating System. [2] [1] [1] [6]

2a. Define operating system, illustrate the Dual mode operation of an operating system. [2] [1] [1] [6]

2b. Explain different services provided by an operating system. [2] [1] [1] [8]

2c. Explain the structure of any Three internal/ external UNIX commands and illustrate their use. [2] [1] [1] [6]

3a. Define a process. With the help of a neat diagram explain the Process Control Block. [2] [2] [1] [6]

3b. Calculate the average waiting times for the given processes using preemptive SJF and Non-preemptive SJF scheduling algorithms. Draw the neat Gantt Chart for both.

Process	Arrival time	CPU burst time(ms)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

3c. Explain Priority Scheduling Algorithm with its advantages and disadvantages. [4] [2] [1, 2] [8]

4a. With the help of a neat diagram explain the Process State Diagram. [2] [2] [1] [6]

4b. Consider the following set of Processes, with their CPU Burst in milliseconds.

Process	Burst Time
P1	8
P2	10
P3	9
P4	5

1. Draw the Gantt Chart by applying SJF and Round Robin (time Quantum=5 ms) scheduling algorithms.

2. Calculate average waiting time and average turn around time for both the scheduling algorithms. [4] [2] [1, 2] [8]

4c. Explain different scheduling criteria that must be kept in mind while choosing scheduling algorithms [2] [2] [1] [6]

5a. What is Race condition? Explain the general structure of a process while solving Critical section problem.

[2] [2] [1] [6]

5b. What is a critical section problem? Explain the Peterson's solution.

[2] [2] [1] [8]

5c. Explain the necessary conditions that are required for the occurrence of Deadlocks?

[2] [2] [1] [6]

6a. Define Semaphores along with its implementation.

[2] [2] [1] [6]

6b. A system consists of five processes and three resource types (A, B, C). Resource type A has 10 instances, B has 5 instances and C has 7 instances. The following snapshot of the system has been taken:

	Allocation				Max		Available	
P0	0	1	0	7	5	3	3	2
P1	2	0	0	3	2	2		
P2	3	0	2	9	0	2		
P3	2	1	1	2	2	2		
P4	0	0	2	4	3	3		

Compute the Need matrix, and Analyze the system for the safe sequence by using Banker's algorithm. Mention whether the above system is safe or not.

[4] [2] [2] [8]

6c. Illustrate the Dining Philosopher's problem of process synchronization with a neat diagram.

[2] [2] [1] [6]

7a. What is paging? Explain the hardware support for paging using TLB with a neat diagram.

[2] [3] [1] [10]

7b. For the following reference string, determine the page faults that occur using FIFO and LRU page replacement algorithms for 3 and 4 page frames.

Reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

[4] [3] [1, 2] [10]

8a. With a block diagram explain the process of swapping of two processes in memory.

[2] [3] [1] [10]

b. For the following reference string, determine the page faults that occur using LRU and Optimal page replacement algorithms for 3 and 4 page frames. Reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1.

[4] [3] [1] [10]

9a. Explain the file attributes and file operations, briefly.

[2] [4] [1] [10]

9b. Explain file mounting with an example.

[2] [4] [1] [10]

10a. List and explain the different file access methods.

[2] [4] [1] [10]

10b. Explain the different types of directory structures, with examples and mention their advantages and disadvantages.

[2] [4] [1] [10]

USN : _____

Course Code : 18CS43

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021
DATABASE MANAGEMENT SYSTEM

Time: 3 hrs

Max. Marks :100

Instructions : Answer any Five full Questions. 2 All units carry equal marks.

L CO PO M

1a. Discuss the main characteristics of the database approach and how it differs from traditional file systems.

[2] [1] [1] [10]

1b. Identify the entities, attributes, relationships and cardinality ratios for the following and then sketch an Entity-Relationship diagram based on the following business rules:

1. A salesperson may manage many other salespeople.
2. A salesperson is managed by only one salespeople.
3. A salesperson can be an agent for many customers.
4. A customer is managed by one salespeople.
5. A customer can place many orders.
6. An order can be placed by one customer.
7. An order lists many inventory items.
8. An inventory item may be listed on many orders.
9. An inventory item is assembled from many parts.
10. A part may be assembled into many inventory items.
11. Many employees assemble an inventory item from many parts.
12. A supplier supplies many parts.
13. A part may be supplied by many suppliers.

[3] [2] [3] [10]

2a. Explain the three-schema architecture. Why do we need mappings between schema levels?

[2] [1] [1] [10]

2b. Analyze a hospital management system and sketch an Entity-Relationship diagram by :

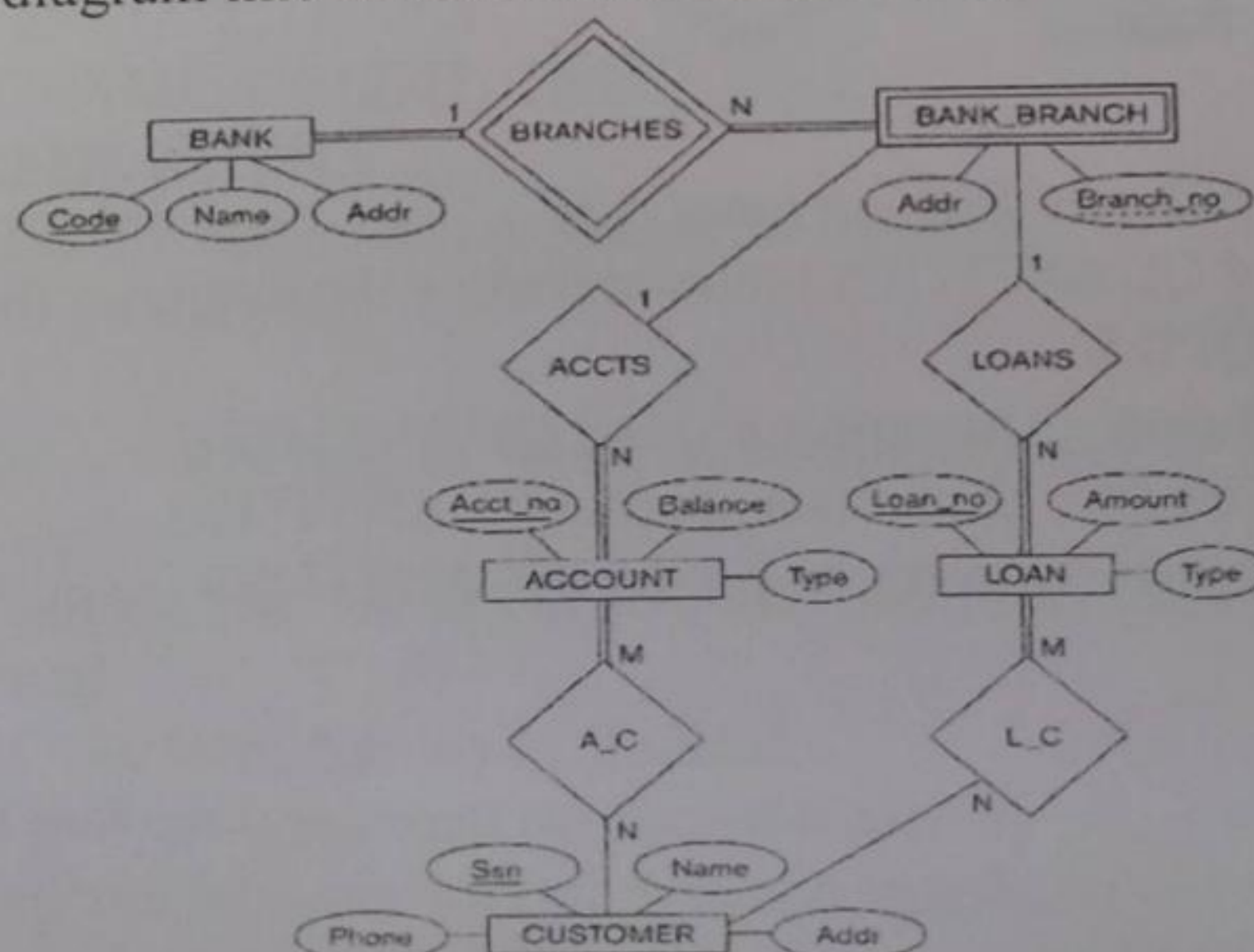
- 1) Identifying the various entities and their attributes,
 - 2) Specifying the key attributes of each entity type,
 - 3) Identifying the various relationships between the entities and
 - 4) The structural constraints on each relationship type.
- Make appropriate assumptions and state the same.

[4] [2] [3] [10]

3a. With an example explain the different types of join operations in Relational Algebra.

[2] [1] [1] [10]

3b. Consider the ER diagram given below. Apply the ER-to-Relational mapping algorithm to map the following ER-diagram into a relational database design.



[3] [2] [3] [5]

3c. Consider the following schema for a library database:

Author (authorname, citizenship, birthyear)

Book(isbn, title, authorname)

Topic(isbn, subject)

Branch(libname, city)

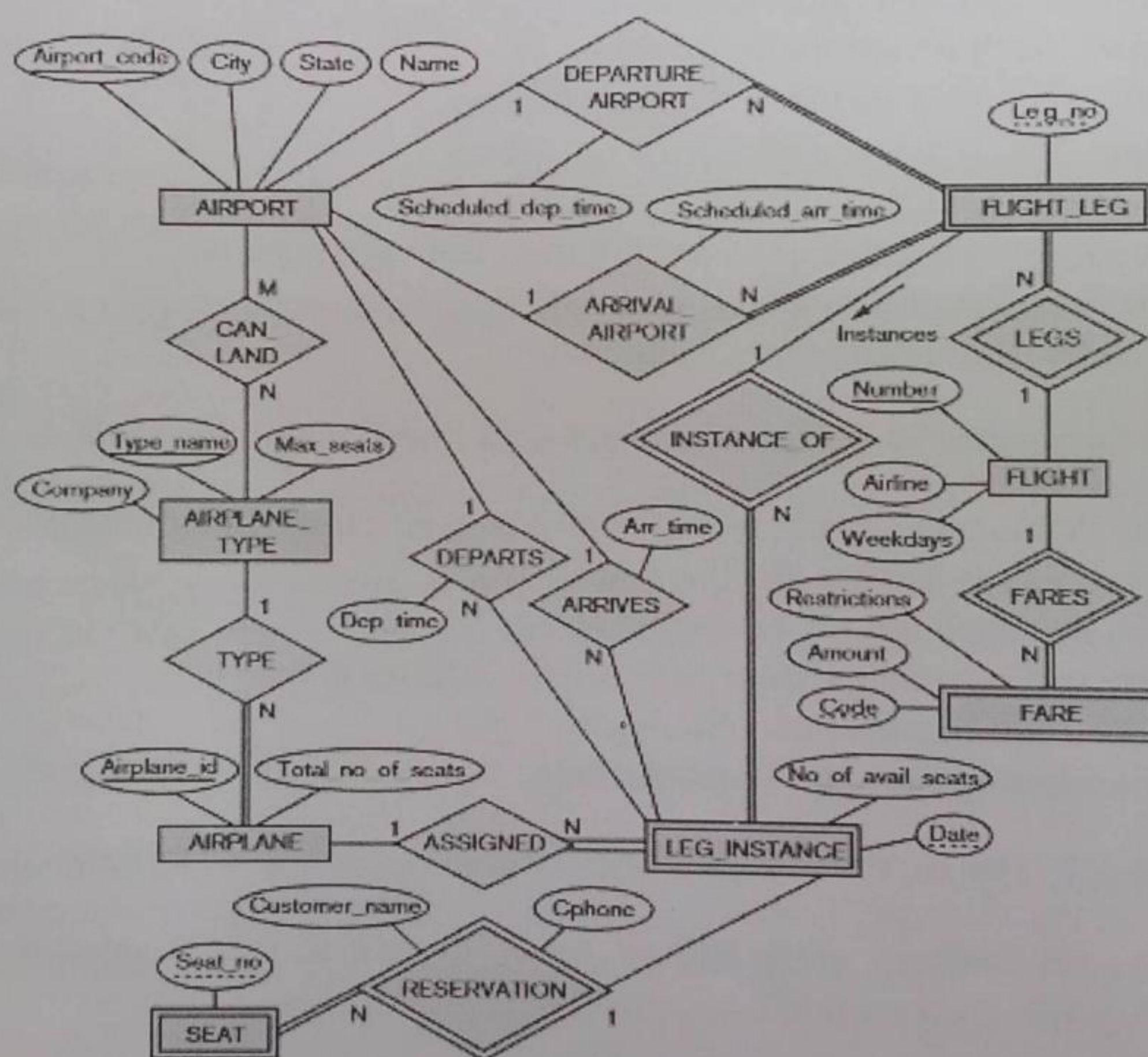
Instock(isbn, libname, quantity)

Solve for the following queries by writing relational algebra expressions:

1. Give all authors born after 1940.
2. Give the names of libraries in Sydney.
3. Give the title of each book on the topic of either alcohol or drugs.
4. Give the title and author of each book of which at least two copies are held in a branch located in Melbourne.
5. Give the name of each Italian author who wrote an autobiography.

[3] [1] [3] [5]

4a. Consider the ER diagram for an AIRLINE database schema given below. Apply the ER-to-Relational mapping algorithm to map the following ER-diagram into a relational database design.



4b. How is an inner join different from an outer join?

[3] [2] [3] [10]

Consider the PRICES and QUANTITIES tables and show the output of the following:

1. PRICES \bowtie QUANTITIES
2. PRICES \bowtie Prices.product = Quantities.product QUANTITIES
3. PRICES \bowtie Prices.product = Quantities.product QUANTITIES
4. PRICES \bowtie Prices.product = Quantities.product QUANTITIES

TABLE 1: PRICES

PRODUCT	PRICE
Potatoes	\$3
Avocados	\$4
Kiwis	\$2
Onions	\$1
Melons	\$5
Oranges	\$5
Tomatoes	\$6

TABLE 2: QUANTITIES

PRODUCT	QUANTITY
Potatoes	45
Avocados	63
Kiwis	19
Onions	20
Melons	66
Broccoli	27
Squash	92

[2] [1] [3] [5]

4c. Explain the following with an example for each:

1) Domain Constraint 2) Super key 3) Candidate key 4) Entity integrity constraint 5) Referential Integrity constraint

[2] [1] [1] [5]

5a. Consider the following relation schema:

CAR_SALE(Car#,Date_sold,Salesperson#,Commission%,Discount_amt)

Assume that a car may be sold by multiple salespeople, and hence {Car#,Salesperson#} is the primary key.

Additional dependencies are:

Date_sold → Discount_amt and

Salesperson# → Commission%.

Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why or why not? How would you successively normalize it completely? Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.

[3] [3] [2] [10]

5b. Discuss the ACID properties of a database transaction.

[2] [5] [1] [5]

5c. Draw a state diagram and discuss the typical states that a transaction goes through during execution.

[2] [5] [1] [5]

6a. What is normalization and why is it needed? Explain the 1NF, 2NF and 3NF with an example for each.

[3] [3] [2] [10]

6b. What is a lock? Explain the different types of locks used in concurrency control?

[2] [5] [1] [5]

6c. What is the two-phase locking protocol? How does it guarantee serializability?

[2] [5] [1] [5]

7a. Explain the various DML commands used in SQL along with their syntax.

[2] [4] [1] [10]

7b. Assume the following relational database: STUDENT (USN, NAME, SEM, DNO)

DEPARTMENT (DNO, DNAME, DLOC)

COURSE (COURSE#, CNAME, CREDIT, TYPE)

ENROLL (USN, COURSE#, SCORE)

1) Write appropriate SQL DDL statements to define the database.

2) Infer SQL queries for the following:

a. List all students who are studying in 'Mechanical Engineering Department' and are in 4th semester.

b. List names of all students who are in 5th semester and have opted for elective courses and belong to 'CSE' department

c. List the Department wise total number of students.

d. List the department that has maximum number of students.

List total number of students who are in 2nd semester and have scored above 15 in 'Maths' subject.

[4] [4] [3] [10]

8a. List and explain the various constraints used in SQL with an example for each

[2] [4] [1] [10]

8b. Consider the CUSTOMERS table having the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	Ramesh	35	Ahmedabad	2000.00
2	Khilan	25	Delhi	1500.00
3	kaushik	23	Kota	2000.00
4	Chaitali	25	Mumbai	6500.00
5	Hardik	27	Bhopal	8500.00
6	Komal	22	MP	4500.00
7	Muffy	24	Indore	10000.00

Solve by inferring the output of the following SQL queries? Illustrate the output in the table/other form as applicable.

i) SELECT * FROM CUSTOMERS WHERE ID IN (SELECT ID FROM CUSTOMERS WHERE

SALARY > 4500);

ii) UPDATE CUSTOMERS SET SALARY = SALARY * 0.25 WHERE AGE IN (SELECT AGE FROM CUSTOMERS WHERE AGE >= 27);

iii) SELECT AGE FROM CUSTOMERS GROUP BY age HAVING COUNT(age) >= 2;

iv) SELECT NAME, Max(Salary) AS MAX_SALARY, Min(Salary) AS MIN_SALARY, Avg(Salary) AS AVG_SALARY FROM CUSTOMERS;

v) DELETE FROM CUSTOMERS WHERE AGE IN (SELECT AGE FROM CUSTOMERS WHERE AGE >= 27);

[4] [4] [3] [5]

8c. Explain with syntax how the ALTER TABLE statement can be used to add, delete, or modify columns in an existing table and to add, drop various constraints on an existing table.

[2] [4] [1] [5]

9a. Differentiate between a PL/SQL function and a procedure? Explain with syntax how a standalone function can be created in PL/SQL. Develop a PL/SQL function that computes and returns the maximum of two values.

[2] [4] [1] [10]

9b. When would you use a PL/SQL loop? With syntax and an example, explain the PL/SQL FOR and WHILE loops

[2] [4] [1] [5]

9c. Define a cursor. Compare implicit and explicit cursors.

[2] [4] [1] [5]

10a. What is the difference between a function and procedure in PL/SQL? Explain with syntax how a procedure can be created in PL/SQL. Develop a PL/SQL procedure that takes two numbers using IN mode and returns their minimum using OUT parameters.

[2] [4] [1] [10]

10b. What are the components of PL/SQL block structure? Explain with syntax and an example

[2] [4] [1] [5]

10c. Define a trigger. Explain the syntax for creating a trigger.

[2] [4] [1] [5]

USN : _____

Course Code : 18CS44

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021
DESIGN AND ANALYSIS OF ALGORITHM

Time: 3 hrs

Max. Marks :100

Instructions : Answer any Five full Questions.

L CO PO M

1a. Explain algorithm design and analysis process with a neat diagram.

[2] [1] [1] [10]

1b. Write Selection Sort algorithm. Apply the algorithm to sort the character array $c[10]=\{\text{"EXAMPLE"}\}$

[3] [1] [1] [10]

2a. Discuss Asymptotic Notations with definition, example and a graph.

[2] [1] [1] [10]

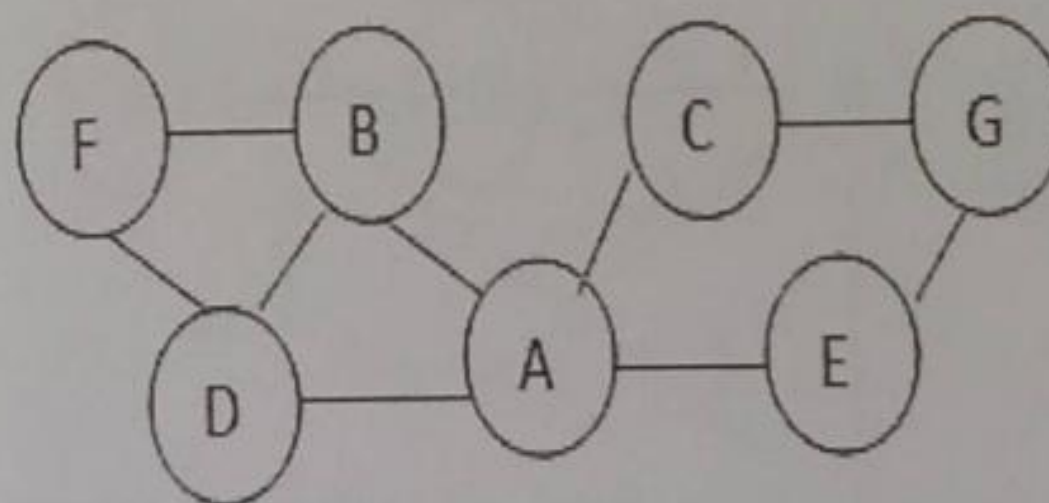
2b. Solve Tower Of Hanoi problem for $n=3$. Solve recurrence relation and find the order of growth of an algorithm.

[3] [1] [1] [10]

3a. Discuss divide and conquer strategy. Apply Quick Sort to sort the list 5,3,1,9,8,2,4,7. Trace the algorithm and draw the recursive tree.

[3] [2] [2] [10]

3b. Write Depth First Search algorithm and apply it to the following graph. Considering the starting node as A.



4a. What is a Heap? Apply Heap Sort algorithm to sort the following list. 5,2,8,7,6,9,1,4, Show all the steps.

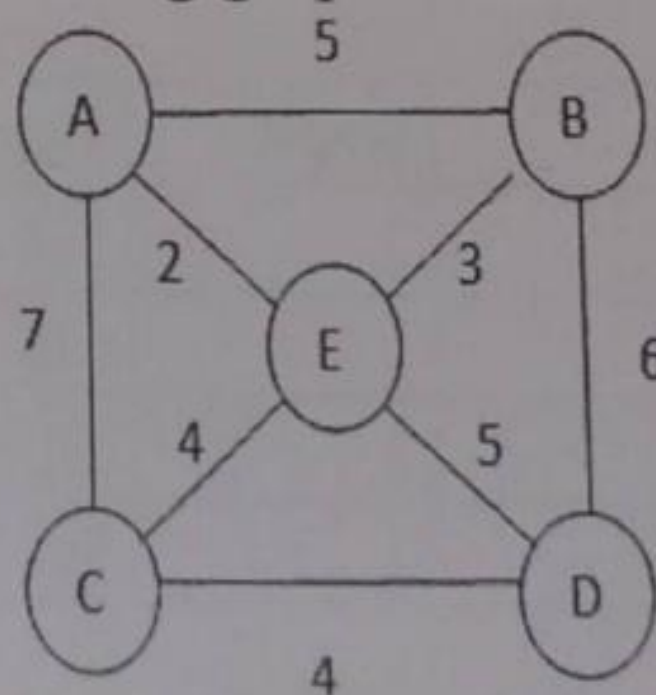
[3] [2] [2] [10]

4b. Apply Strassen's matrix multiplication algorithm to multiply $A_{2 \times 2} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ $B_{2 \times 2} = \begin{bmatrix} 9 & 5 \\ 6 & 7 \end{bmatrix}$

[3] [2] [2] [10]

[3] [2] [1] [10]

5a. Apply Prim's algorithm for the following graph to find minimum cost spanning tree.



[3] [3] [2] [10]

5b. For the given table, Construct a Huffman coding tree and carry out the following operations.

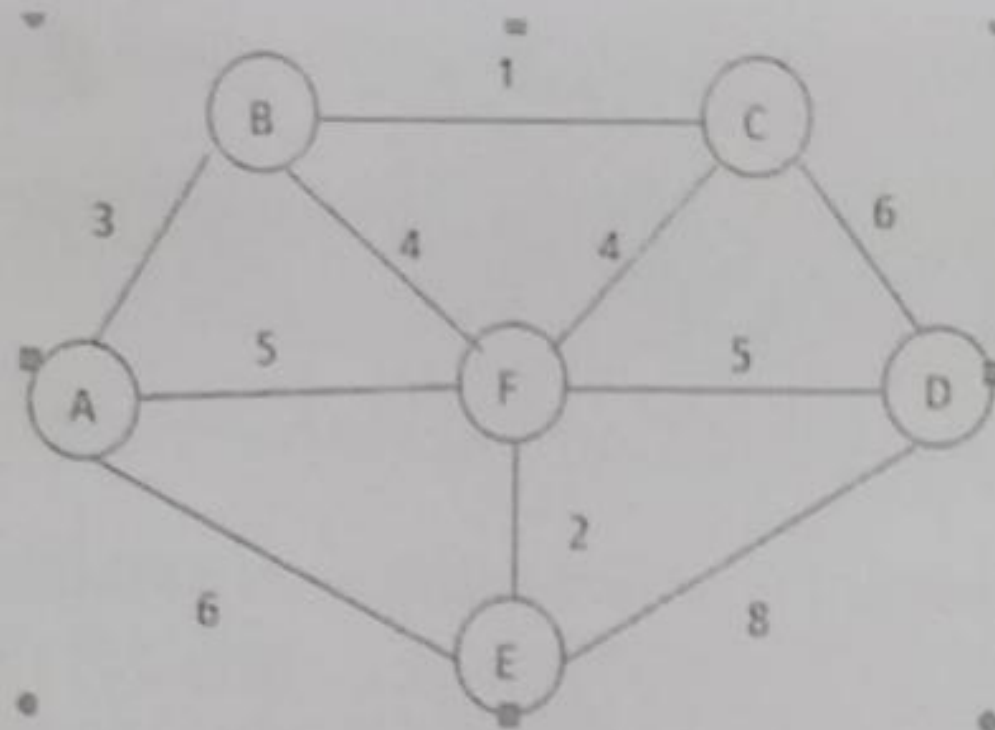
1. encode DAD

2. decode 10011011011101

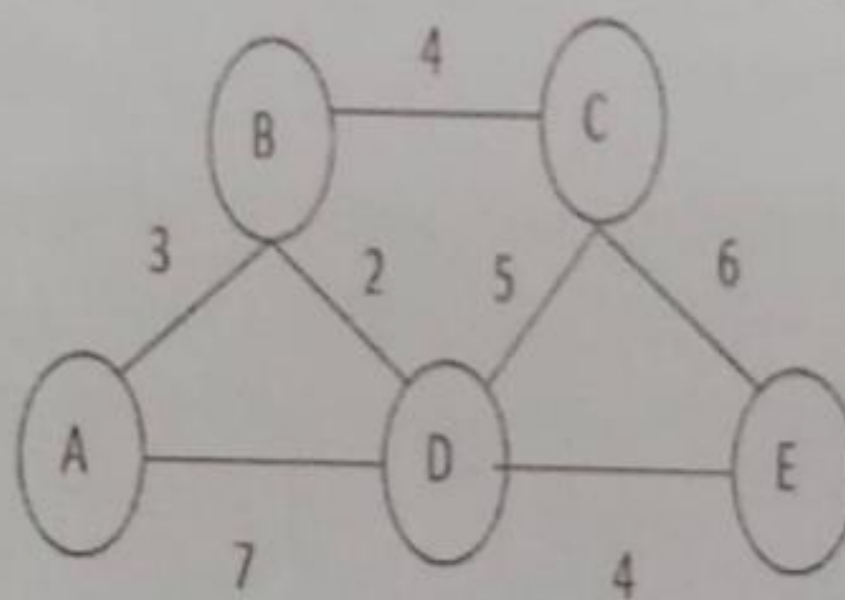
3. calculate compression ratio

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

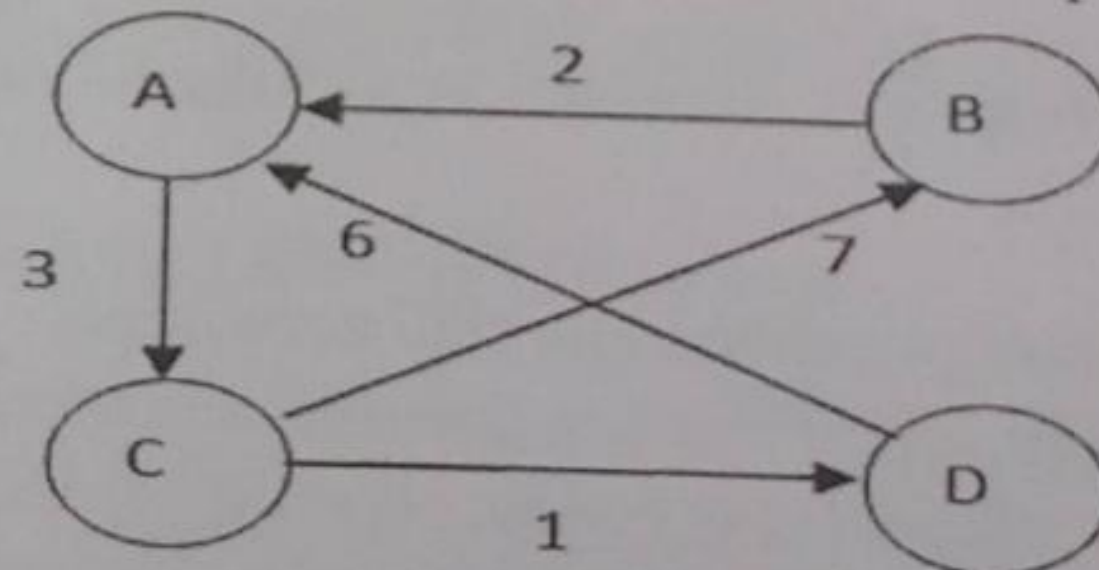
6a. Write Kruskal's Algorithm and apply it to find minimum cost spanning tree for the following graph. [3] [3] [4] [10]



6b. Apply Dijkstra's Algorithm to find single source shortest path from A. [3] [3] [2] [10]



7a. Write Floyd's algorithm and apply it to find all pair's shortest path. [3] [3] [2] [10]

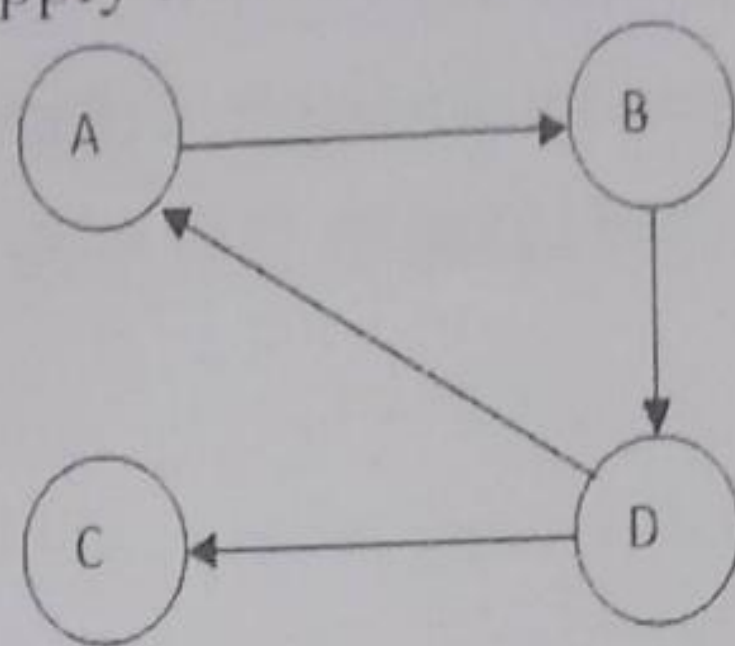


7b. Discuss Dynamic Programming. Solve the following Knapsack problem using dynamic programming. Knapsack Capacity $W=5$ [3] [3] [2] [10]

Item	Weight	Value
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

[3] [3] [1] [10]

8a. Write Warshall's algorithm and apply it to find transitive closure of a given graph



[3] [3] [2] [10]

8b. Discuss dynamic programming. Apply it to compute nCr . Build 4 X 4 matrix

[3] [3] [2] [10]

9a. Draw the state space tree to solve 4-queens problem by Backtracking. Find all the solutions.

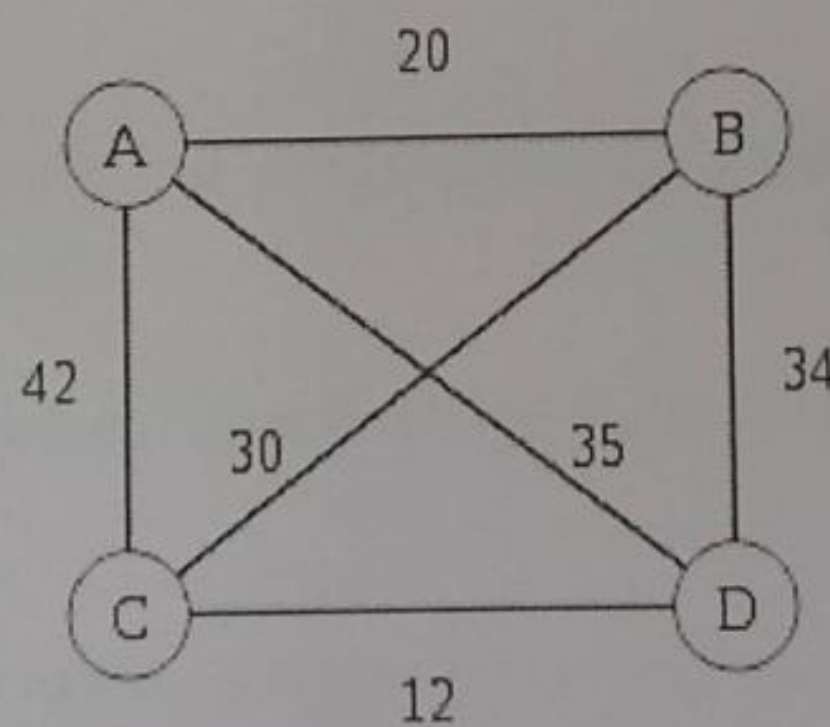
[3] [5] [4] [10]

9b. Illustrate Branch and Bound approach by applying it to the following job assignment problem.

	Job 1	Job 2	Job 3	Job 4
Person a	9	2	7	8
Person b	6	4	3	7
Person c	5	8	1	8
Person d	7	6	9	4

[3] [5] [4] [10]

10a. Solve the following Travelling Salesman problem using Branch and Bound technique. Draw State Space tree. Find the optimal solution.



[3] [5] [2] [10]

10b. Apply Horspool's algorithm to find the pattern BARBER in the text JIM_SAW_ME_IN_A_BARBERSHOP. Build Shift table.

[3] [4] [2] [10]

USN : _____

Course Code : 18CS45

Fourth Semester B.E MAKEUP Examination, AUGUST-OCTOBER_2021
SOFTWARE ENGINEERING

Time: 3 hrs

Max. Marks :100

Instructions : Answer any five full questions. Assume missing data

L CO PO M

- 1a. Define Software Engineering, List and Explain essential attributes of good software? [2] [1] [1] [6]
- 1b. With a neat diagram explain waterfall model? Explain the problems involved in waterfall model? [2] [1] [1] [6]
- 1c. List and explain Software Engineering (ACM/IEEE) Code of Ethics and Professional Practices? [2] [1] [8] [8]
- 2a. Explain the difference between Generic and Customized product with example? [2] [1] [1] [6]
- 2b. Compare and differentiate between Change avoidance & Change tolerance with example. [4] [1] [1] [6]
- 2c. Explain Reuse-oriented developmental model with a neat diagram? Also discuss the benefits of this model as compared to waterfall model? [2] [1] [1] [8]
- 3a. With the neat diagram explain the types of non-functional requirements? [2] [1] [1] [6]
- 3b. Identify and explain 03 Functional and 03 Non-Functional requirements for the GIT Examination software system. [3] [1] [12] [6]
- 3c. Explain in brief the structure of a requirements document that is based on an IEEE standard for requirements documents. [2] [1] [1] [8]
- 4a. Explain with a neat diagram the different steps in the requirements elicitation and analysis process? [2] [1] [1] [6]
- 4b. Describe different metrics for specifying non-functional requirements? [2] [1, 2] [1] [6]
- 4c. List the different formats of specifying system requirement specification. For student admission process in engineering colleges under CET/COMEDK/MANAGEMENT Quota. Use any one of the function you have identified related to admission process and represent it using structured form based specification method. [4] [1] [3] [8]
- 5a. Explain Context model with an example [2] [1] [1] [6]
- 5b. Develop a set of Use Cases that would serve as bases for understanding the requirement for a Software Engineering attendance management system. Note: Actors: Faculty, Students, COE, Dean academics, University. [3] [2] [3] [6]
- 5c. With a neat diagram explain the flow of Analysis model into the design model [4] [4] [3] [8]
- 6a. With a neat diagram explain the difference between plan driven development and Agile Development [2] [1] [1] [6]
- 6b. List and Explain Extream programming practices. [2] [3] [1] [6]

6c. Analyze the credit card due payment method in Banking Application, design 1 story card, 2 task cards and 2 test cards for the same. [2] [3] [1] [8]

7a. Describe the factors affecting Software Pricing. [2] [3] [1] [5]

7b. With a neat diagram explain the project planning process. [2] [2] [1] [7]

7c. Draw the 'Activity Bar-chart' for the following project schedule.

Task	Duration	Dependency
T1	10	
T2	15	
T3	15	T1(M1)
T4	10	
T5	10	T2,T4(M3)
T6	5	T1,T2(M4)
T7	20	T1(M1)
T8	25	T4(M2)
T9	15	T3,T6(M5)
T10	15	T7,T8(M6)

8a. List the Project Plan sections and also explain in brief the various Project plan supplements. [3] [2] [3] [8]

8b. Discuss algorithmic cost modeling formula to show the efforts put in to predict project costs [2] [3] [1] [6]

Calculate the Effort where organizational dependent constant is 2, B=1.05, Multiplier is 2, size is 10.

8c. Define Project Scheduling. With a neat diagram explain project scheduling process in a plan driven project? [3] [3] [3] [6]

[2] [2] [11] [8]

9a. Explain with a neat diagram input-output model for program testing.

[2] [4] [1] [6]

9b. With a neat diagram explain test driven development process .

[2] [4] [1] [6]

9c. Elective Subject allocation for 7th semester students is done by the Head of the Department of CSE through web interface software. Analyze the given requirements and design test cases for the same by using Requirements-based testing. "For the 7 semester students of the CSE, department needs to allocate Elective subject based on student's previous semester academic performance and the subject preferences given by the student in the subjects of relative domain. If a student has performed less in a particular domain, then allocation of an elective in a relative domain shall produce warning message being issued to the Head of the department. If the Head of the Department chooses to ignore the warning, then he has to provide valid reason why this warning has been ignored" .

[4] [4] [3] [8]

10a. Explain with a neat diagram model of software testing.

[2] [4] [1] [6]

10b. Define equivalence partition testing? Analyze the following scenario by using equivalence partition method (Identify valid and invalid partitions), Assume we have to test a text field (Name) that accepts the length between 6-12 characters.

10c. With a neat diagram explain acceptance testing process and also discuss its stages. [4] [4] [3] [6]

[2] [4] [1] [8]