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International Islamic University Chittagong
Department of Computer Science and Engineering
Final Examination, Autumn-2018   Semester: 4th
Course Code: **CSE-2407**   Course Title: **Database System**
Time: 2 Hours and 30 minutes   **Marks:** 50

[*Answer any **two** questions from **Group A** and any **three** questions from **Group B**.*

Use a separate answer scripi for Group A & B]

Group A

Q1. **a)** Define event-condition-action Model.   1+4
"Inconsistency and loss of data will occur if the appropriate Database Integrity and security measures not ensured"? If you agree, Explain with examples.

b) Consider the following relational database: 5
Passenger (P-id, Pname, Address, mobile, e-mail)
Ticket (T-id, Pid, Bid, emp_id, Data-of-journey, Time, No_of_tickets, Amount)
Bus (B-id, B-name, router, No-of-Seats, unit_price)
Employee(emp-id, ename, salary, designation, address)
Give an SQL DDL definition of this database. Identify referential-integrity constraints that should hold, and include them in the DDL definition.
Special consideration: Pname and ename (not null), Mobile (unique), Quantity (not negative), *No_of_tickets (minimum 1)*

Q2. **a)** When cascade update or cascade delete can be helpful?   2
b) Explain different measures of secured data transfer.   2
c) Define functional dependency. Write the rules for BCNF. When a relational schema will be in 1NF, 2NF, and 3NF.   6

Q3. **a)** Distinct between trivial, non-trivial and Multivalued dependency with example.   3
b) How does Armstrong's Axioms helpful in normalization.   2

c) Write down the objectives of Normalization? Normalize the following table up to Third Normal Form, if it is not normalized   1+4

CID	C_NAME	PNO	P_ADDRESS	RENT	RENT_START	RENT_FINISH	O_NO	ONAME
C1	Abdullah	P1	GEC,CTG	1000	1-1-17	31-7-17	01	Ashiq
		P2	2 NO GATE,CTG	3000	31-7-17	31-12-17		
C2	Akbar	P1	cda,ctg	1000	1-1-18	30-6-18	02	shoib
		P3	Agrabad,ctg	2000	1-2-17	31-8-18		
		P2	City gate, ctg	3000	31-12-18	31-1-19		

Group B

Q4. **a)** Indices speed query processing, but it is usually a bad idea to create indices on every attribute, and every combination of attributes, that is a potential search key. Explain why.   2

       b) When does multi-level indexing preferable? Justify your answer with examples.   3

       c) Show the differences between a clustering index and a secondary index?   2

       d) Why does ideal hash function preferable? Explain in comparison to worst hash function.   3

Q5. **a)** Define a database transaction. What are the main issues to deal with for transaction design?   2

       b) Draw the state diagram of a transaction and explain its different states.   4

       c) Explain how the shadow copy technique works. Write an equivalent schedule for the following schedule.   4

T_1	T_2
read(A)	
$A := A - 50$	
write (A)	
read(B)	
$B := B + 50$	
write (B)	
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
	read(B)
	$B := B + temp$
	write(B)

Q6. **a)** Database-system implementers have paid much more attention to the ACID properties than have file-system implementers. Why might this be the case?   4

       b) What is a deadlock? Why is concurrency important?   2

       c) Define distributed database. Compare between homogeneous and heterogeneous distributed database.   4

Q7. **a)** Differentiate between Dirty read and Fuzzy Read with examples.   3

       b) Show that the two-phase locking protocol ensures conflict serializability.   3

       c) Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed?   2

       d) When is it useful to have replication or fragmentation of data? Explain your answer.   2

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International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. in CSE Semester Final Examination, Spring 2018
Course Code: CSE 2407 Course Title: Database System
Total marks: 50   Time: 2.5 hours

[Answer any *two* questions from **Group-A** and any *three* questions from **Group-B**;
Separate answer script must be used for Group-A and Group-B.]

Group A

Q1. **a)** How does Integrity could be ensured in the database? If not ensured, what will be the possible consequences? Explain the both situations with at least two examples.   5

b) Consider the following relational database: 5

Guest (Guest_id, Guest_name, Guest_address, mobile)

Books (B_id, Guest_id, Room_no, Check_in_date, Check_out_date)

Room (Room_no, Rate, Type)

Orders (Guest_id, Food_id, Date, Time, Quantity)

Food (Food_id, Rate, Type)

Give an SQL DDL definition of this database. Identify referential-integrity constraints that should hold, and include them in the DDL definition.

Special consideration: Rate and Type (not null), Mobile (unique), Quantity (not negative)

Q2. **a)** What is referential integrity? Explain the tests that must be made to preserve referential integrity for update operation.   4

b) Why do we need security in database? Describe different security levels to protect a database.   4

c) Draw an authorization grant graph and explain its use.   2

Q3. **a)** "Functional Dependency is the key for the database Normalization", Explain.   2

b) Given the following Relation, Identify and resolve each of the anomalies of the relation by using different normalization technique (Up to Third).   6

Full Names	Physical Address	Movies rented	Salutation	Category
Janet Jones	First Street Plot No 4	Pirates of the Caribbean, Clash of the Titans	Ms.	Action, Action
Robert Phil	3rd Street 34	Forgetting Sarah Marshal, Daddy's Little Girls	Mr.	Romance, Romance
Robert Phil	5th Avenue	Clash of the Titans	Mr.	Action

c) Differentiate Trivial, Non-Trivial Functional dependency with example.   2

Group B

Q4. a) When it is preferable to use a dense index rather than a sparse index. Explain your answer.   3

b) Explain multilevel indexing with necessary figure.   3

c) What is a B+ tree? Compare between primary and secondary indices.   4

Q5. a) What is a transaction? Explain its ACID properties with examples.   4

b) Draw the state diagram of a transaction and explain.   3

c) Explain the shadow copy technique.   3

Q6. a) How could you identify ideal hash functions? Write down the benefits of Linear Probing over closed hashing.   2+2

b) How could you resolve the problems of skewness? Illustrate with figure   2

c) "A transaction should meet four properties to be a successful transaction", List out them and Justify your answer with example.   4

Q7. a) How could you resolve the problems of concurrency in transactions? Illustrate with at least two methods?   4

b) Write down the working procedure of tree protocol.   2

c) Among Fragmentation and Replication issues of Distributed Database, which one is preferable? Why?   2

d) Explain three possible ways of deadlock recovery of transaction?   2

International Islamic University Chittagong
Department of Computer Science and Engineering
Final Examination, Spring-2019   Semester: 4th

Course Code: **CSE-2423**   Course Title: **Database Management System**
Time: 2 Hours and 30 minutes   Marks: 50

*[Answer any **two** questions from **Group A** and any **three** questions from **Group B**. Use separate answer script for Group A & B]*

Group A

Q1.

a) Identify and Define each of the different ways that could be applied to ensure database integrity.   3

b) Consider a database that includes the following relations: 3
salaried-worker (*name, office, phone, salary*)
hourly-worker (*name, hourly-wage*)
address (*name, street, city*)
Suppose that we wish to require that every name that appears in *address* appear in either *salaried-worker* or *hourly-worker*, but not necessarily in both. Propose syntax for expressing such constraints.

c) How Referential Integrity does helps to maintain database Consistency? Explain on the basis of following relational database: 4
Customer (*Customer_id*, *Customer-name, street, city, mobile*)
Sales (*Sales-id,Customer-id, Product-id, quantity, sales_date, time*)
Product (*Product-id*, *Product-name, Unit-price*)

Q2.

a) Define trivial, non-trivial, multi-valued, and Transitive dependency? Give example of each.   4

b) What is the purpose of having separate categories for index authorization and resource authorization? Explain with example.   3

c) Perhaps the most important data items in any database system are the passwords that control access to the database. Suggest a scheme for the secure storage of passwords with its relevant advantages.   3

Q3.

a) Explain functional dependency and Boyce-Code Normal Form (BCNF)   3

b) Apply 1NF, 2NF and 3NF on the following database table named TEACHER make them normalized.   7

Teacher_ID	Subject	Teacher_Post_Code	Teacher_Address
330	Chemistry, Biology	4203	Chawlkbazar
440	English	4212	Chandgaon
550	Math, Computer	4216	Halishahar
660	Physics	4210	Bayezid Bostami

Where prime attribute set = {Teacher_ID, Subject} and Teacher_Post_Code is functionally dependent on Teacher_ID also Teacher_Address is functionally dependent on Teacher_Post_Code.

Group B

Q4.

a) How the working procedure of Indexing and Hashing does differ? Explain.   4

b) Given the following B+ tree, perform the operations stated below: 6
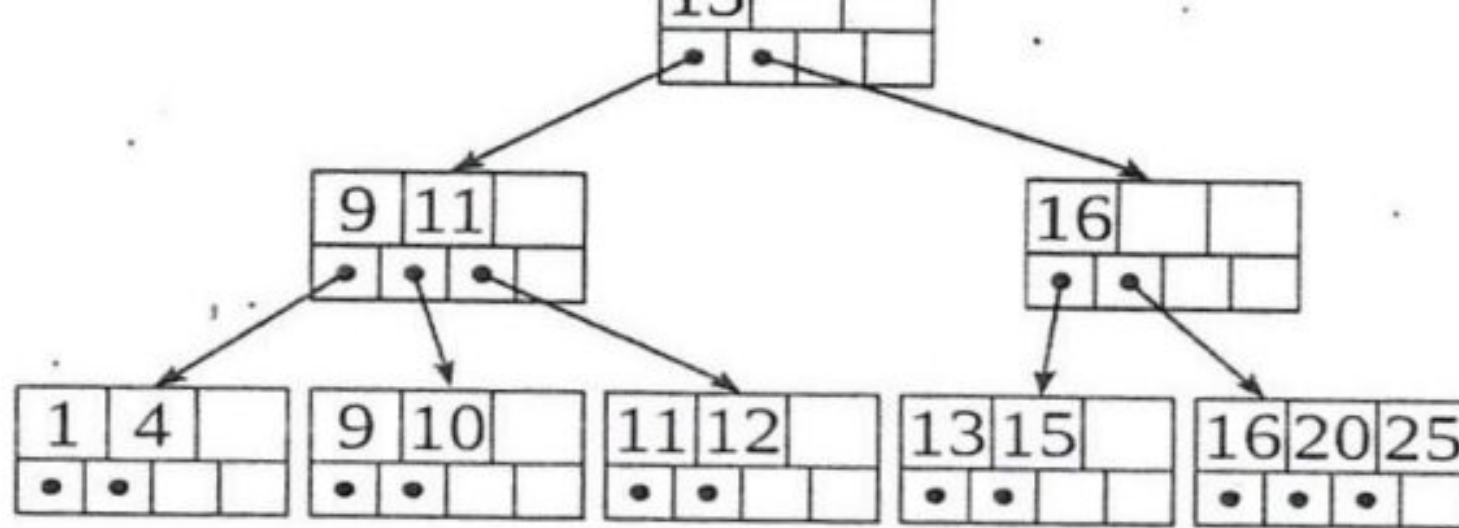
1. Insert 5, 8, 17, 18,21,22,28
2. Delete 9, 16

Q5.
a) When hash is better in performance than Indexing? Explain with example. **3**
b) Database-system implementers have paid much more attention to the ACID properties than have file-system implementers. Why might this be the case? **3**
c) Explain the distinction between the terms *serial schedule* and *serializable schedule* with example. **4**

Q6.
a) Identify, which of the following situations of transactions T3 and T4, database consistency will be preserved in.? **03**
    I.   Both of T3 and T4 want to read table X.
    II.   T3 wants to read but T4 wants to write the table Y.
    III. T4 wants to read a table named Z while T3 tries to Write another table P.

b) Determine whether the following schedule of transactions T1 and T2 is conflict serializable or not. **05**

T1	T2
Read (B)	Read (B)
B←B+1	B←B+1
Write (B)	Write (B)
Commit	Commit

c) "Consistency and Concurrency are not only rival but also friends of one another in DBMS"-explain **02**

Q7.
a) "Read lock can be shared while write lock is not shareable" why **02**
b) Explain the following wait-for-lock graph and determine whether any deadlock prevails here or not. T1, T2, T3 , T4 and T5 are transactions **05**
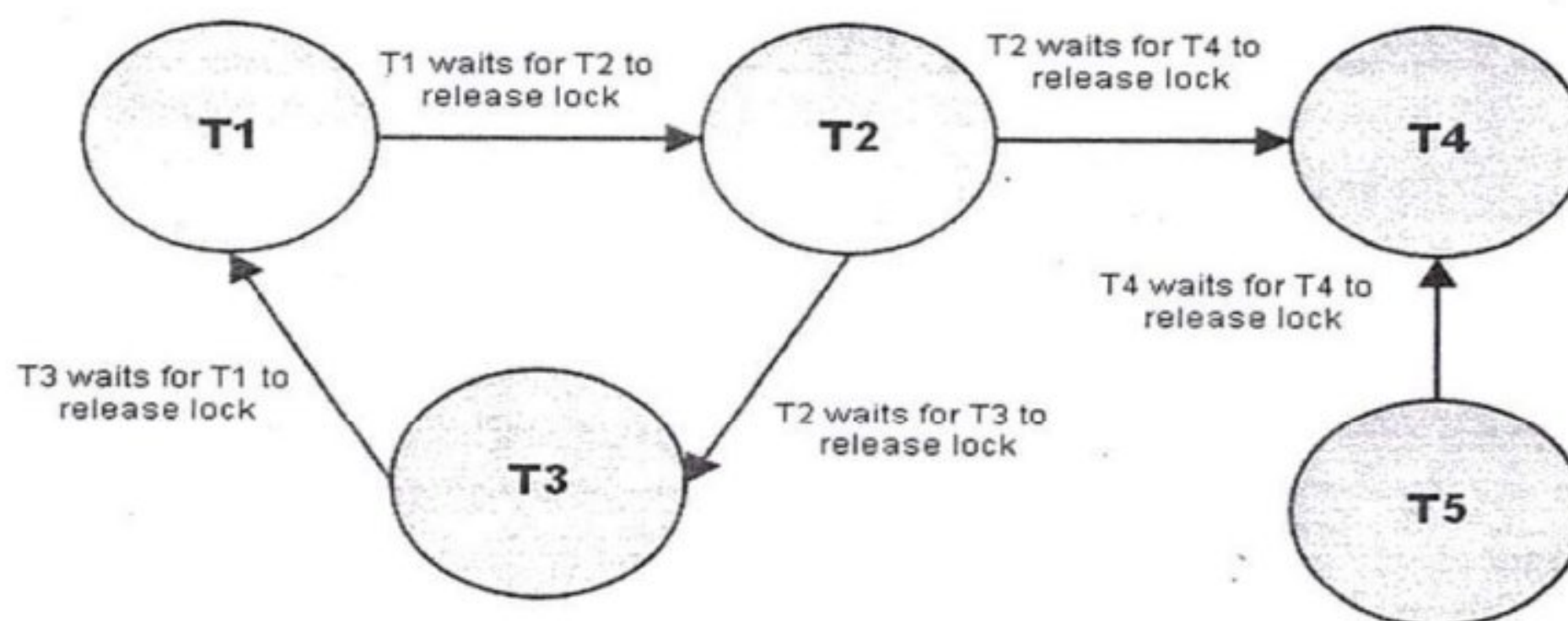
c) "Timestamp based protocols honors seniority but insults juniority" explain **03**

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Examination, Autumn2022
Course Code: CSE 2423   Course Title: Database Management System
Total marks: 30

Time: 2 hours30 minutes

[Answer all the questions; in some questions, there are options;solve the one which you have been instructed to solve:Precisely follow the guideline for preparing and submitting the answer script;Figures in the right-hand margin indicate full marks]

Course Outcomes (COs) of the Questions	
CO1	UnderstandRelational Databases, Database design, Data Storage and Querying, Transaction Management.
CO2	Apply Relational Algebra, SQL, Query Optimization techniques, Data Integrity, Security, normalization techniques, Indexing Techniques, and ACID Properties.
CO3	Createan enterprise data model that reflects the organization's fundamental business rules.

		CO	DL

1. (a) Consider the following relational schema and briefly answer the questions that follow: **6   CO2   Ap**

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

Works(*eid:* integer, *did:* integer, *pct time:* integer)

Dept(*did:* integer, *budget:* real, *managerid:* integer)

1. Write the SQL statements required to create these relations, including all integrity constraints such as primary and foreign keys.
2. Define a domain constraint on Emp that will ensure that every employee makes at least $10,000.
3. Define an assertion on Dept that ensure that all managers have *age* >30.

1. (b) Define referential integrity. Explain the tests that must be made to preserve referential integrity for *delete* operation.   **4   CO1   Un**

2. Suppose you are given a relation R with four attributes $ABCD$. Foreach of the following sets of FDs, assuming those are the only dependencies that holdfor R, do the following: **10   CO2   Ap**

a) Identify the candidate key(s) for R.

b) Identify the types of functional dependencies (FD) that exist. Why do you think those are FDs?

c) Identify the bestnormal form that R satisfies (1NF, 2NF, 3NF, or BCNF).

d) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

1. $C \rightarrow D, C \rightarrow A, B \rightarrow C$
2. $B \rightarrow C, D \rightarrow A$
3. $ABC \rightarrow D, D \rightarrow A$
4. $A \rightarrow B, BC \rightarrow D, A \rightarrow C$
5. $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$

OR

2. When a relational schema will be in 1NF, 2NF, and 3NF. Illustrate with an **CO2 Ap**
example how you can convert the following Schema *Sales Record*
into 3NF.10

CustName	Item	ShippingAdd	Newsletter	Supplier	SupplierPhone	Price
Hasan	Galaxy	3/1 Ctg	Gal-News	Samsung	22-8805568	25000
Kamal	iPhone	2-A Dhk	I-News	Apple	66-5668412	65000
Sojib	Galaxy, iPhone	255 Raj	Gal-News, I-News	Wholesale	Toll-Free	90000
Hasan	iPhone	1/6A Syl	I-News	Apple	66-5668412	65000

GROUP-B

3. (a) Construct a B+-tree for the following set of key values   **5 CO2 Ap**
6, 3, 2, 7, 8, 12,18, 17, 19, 23, 29, 31, 35, 38, 40, 50, 45, 56, 58, 62, 70, 73, 71, 75,
77, 85, 81, 82
Assume that the tree is initially empty and Node Size: Four

3. (b) Explain how you will assess the quality of an index using index evaluation metrics.   **5 CO1 Un**
Compare between:
  1. ClusteringandNon-Clustering indexes.
  2. Dense and Sparse indexes.

4. (a) What is a transaction? Explain its ACID properties with examples.   **4 CO1 Re**

4. (b) Explain how lock-based protocol supports concurrency control. Illustrate how   **6 CO1 An**
deadlock and starvation occur in the lock-based protocol.

OR

4.   a) What is the phantom problem? Can it occur in a database where the set of   **6 CO1 Un**
database objects are fixed and only the values of objects can be changed?

   b) Consider a database with objects X and Y and assume that there are two   **4 CO1 Un**
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 and Y that result 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. For each of the three schedules, show that Strict 2PL disallows the
     schedule.

5. (a) Draw the state diagram of a transaction and describe its states with an example.   **5 CO1 Un**
Explain how the shadow copytechnique supports durability.

5. (b) Write down the differences between log-based recovery and checkpoint-based   **5 CO1 An**
recovery with appropriate examples.

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Department of Computer Science and Engineering
B. Sc. in CSE Final Examination, Spring 2023
Course Code: CSE 2423   Course Title: Database Management System
Total marks: 50   Time: 2 hours 30 minutes
[Answer all the question; Figures in the right hand margin indicate full marks]

		CO	DL

1 (a). Consider the following database schema and answer the questions.   **6 CO2 C3**
Employee(E_id, C_id,E_Name,Email,Phone_no,Salary,Address,F_id)
Customer(C_ID, C_Name, Email,Phone_no,F_id)
Food_Item(F_ID, C_ID,F_Name, Price, Quantity)

1) Write the sql statement required to create these relations, you have to include all integrity constraints.
2) Define constraints on food item table as such quantity should be at least one item.
3) Define constraints on Employee such that a minimum 15000 BDT pay scale is followed by the organization.

1 (b). i) Define referential integrity constraints and domain constraints with example.   **4 CO2 C3**
ii) Describe the following:
a) Encryption and Decryption
b) Privileges..

2 (a). Consider the relation schema R = (A, B, C, D, and E) having following set F of   **8 CO2 C3**
functional dependencies:
$A \rightarrow BC$
$CD \rightarrow E$
$B \rightarrow D$
$E \rightarrow A$

Requirements:
1. Suppose that we decompose the relation schema (A, B, C) and (A, D, E). How that this decomposition is a lossless decomposition if the above functional dependencies holds?
2. Give an example of a relation schema R and a set of dependencies such that R is in BCNF but is not in 4NF.
3. Compute the closure and list the candidate keys for R considering above functional dependencies.

OR

Briefly answer the following questions:
a) Give a set of FDs for the relation schema $R(A,B,C,D)$ with primary key AB under which R is in 1NF but not in 2NF.
b) Give a set of FDs for the relation schema $R(A,B,C,D)$ with primary key AB under which R is in 2NF but not in 3NF.
c) Consider the relation schema $R(A,B,C)$, which has the FD $B \rightarrow C$. If A is a candidate key for R, is it possible for R to be in BCNF? If so, under what conditions? If not, explain why not.

2 (b). What do you understand by functional dependency? Write down and explain the types of functional dependency.　　2　CO

OR

What do you mean by Normalization? Why normalization is important?

GROUP-B

3 (a).
1) Explain the distinction between closed and open hashing. Discuss the relative merits of each technique in database applications.　　6　CO2　C2
2) What are the causes of bucket overflow in a hash file organization? What can be done to reduce the occurrence of bucket overflows?
3) Why is a hash structure not the best choice for a search key on which range queries are likely?

3(b). Consider following B+ tree and perform following operations step-by-step in it　　4　CO2　C3

　　1. Insert 8　　2. Insert 4　　3. Insert 13　　4. Insert 20　　5. Insert 22
　　6. Insert 35　　7. Delete 3　　8. Delete 20　　9. Delete 19　　10. Delete 29
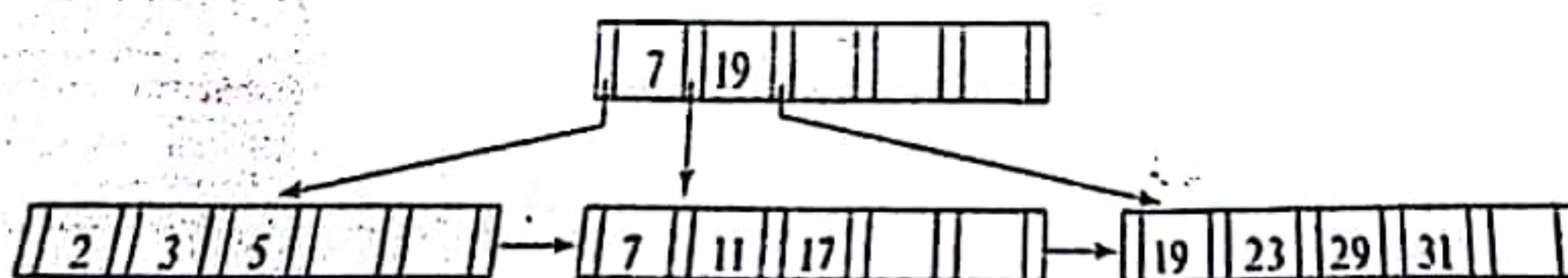
4. Answer the following questions:　　10　CO1　C2
1. Describe how a typical lock manager is implemented. Why must lock and unlock be atomic operations?
2. Contrast the timestamps assigned to restarted transactions when timestamps are used for deadlock prevention versus when timestamps are used for concurrency control.
3. Show that, if two schedules are conflict equivalent, then they are view equivalent.
4. Give an example of a serializable schedule that is not strict.

OR

Answer the following questions:
1. Show that the two-phase locking protocol ensures conflict serializability and that transactions can be serialized according to their lock points.
2. What benefits does rigorous two-phase locking protocol provide? How does it compare with other forms of two-phase locking?
3. Show by example that there are schedules possible under the tree protocols that are not possible under the two-phase locking protocol, and vice versa.
4. Why should transactions need to assure ACID properties?

5(a). What is B+ tree? Compare between primary and secondary indices.　　3　CO1　C2
5(b). When does multilevel indexing preferable? Justify your answer with example.　　3　CO1　C2
5 (c). Construct B+ tree for the following set of key values.　　4　CO1　C2
　　1,6,8,12,15,19,14,18,32,40,51,46,60,55,62
　　Assume that the tree is initially empty and Node Size: 4

** THE END**