

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), May 2019

B. Tech in Computer Science and Engineering, Semester: IV

Roll No.....

CSESP401: Basics of Information Management

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1 Objective type multiple choice questions (10 questions @ 1 mark)

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- i. What is data integrity?
(A) It is the data contained in database that is non redundant.
(B) It is the data contained in database that is accurate and consistent.
(C) It is the data contained in database that is secured.
(D) It is the data contained in database that is shared.
- ii. Which one is true statement :
(A) With finer degree of granularity of locking a high degree of concurrency is possible.
(B) Locking prevents non – serializable schedules.
(C) Locking cannot take place at field level.
(D) An exclusive lock on data item X is granted even if a shared lock is already held on X.
- iii. Which one of the following statements is false?
(A) The data dictionary is normally maintained by the database administrator.
(B) Data elements in the database can be modified by changing the data dictionary.
(C) The data dictionary contains the name and description of each data element.
(D) The data dictionary is a tool used exclusively by the database administrator.
- iv. A DBMS query language is designed to
(A) Support end users who use English-like commands.
(B) Support in the development of complex applications software.
(C) Specify the structure of a database.
(D) all of the above.
- v. Transaction processing is associated with everything below except
(A) Producing detail, summary, or exception reports.
(B) Recording a business activity.
(C) Confirming an action or triggering a response.
(D) Maintaining data.
- vi. Which of the following is not a recovery technique?
(A) Deferred update
(B) Immediate update

	(C) Two-phase commit (D) Shadow paging
vii.	A B-tree of order m has maximum of _____ children (A) m (B) m+1 (C) m-1 (D) m/2
viii.	The Natural join is equal to : (A) Cartesian Product (B) Combination of Union and Cartesian product (C) Combination of selection and Cartesian product (D) Combination of projection and Cartesian product
ix.	The physical location of a record is determined by a mathematical formula that transforms a file key into a record location is : (A) B-Tree File (B) Hashed File (C) Indexed File (D) Sequential File
x.	Which refers to a property of computer to run several operation simultaneously and possible as computers await response of each other a) Concurrency b) Deadlock c) Backup d) Recovery

Q.2 Short answer type questions (5 questions @ 2 marks)

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i.	List six major steps that you would take in setting up a database for a particular enterprise.
ii.	Why certain functional dependencies are called trivial functional dependencies?
iii.	Explain the distinction between closed and open hashing. Discuss the relative merits of each technique in database applications.
iv.	List the ACID properties. Explain the usefulness of each.
v.	Under what conditions is it less expensive to avoid deadlock than to allow deadlocks to occur and then to detect them?

Consider the following schema for Q.3:

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

Part(pid: integer, pname: string, colour: string)

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

The relation Supplier stores suppliers and the key of that relation is sid. The relation Part stores parts, and pid is the key of that relation. Finally, Catalog stores which supplier supplies which part at which cost. The key is the combination of the two attributes sid and pid.

Q.3 Write the following queries in relational algebra based above Supplier-Parts-Catalog schema: 10

- Find the names of suppliers who supply some red part.
- Find the IDs of suppliers who supply some red or green part.
- Find the IDs of suppliers who supply some red part or are based at 21 George Street.
- Find the names of suppliers who supply some red part or are based at 21 George Street.

e) Find the IDs of suppliers who supply some red part and some green part.

OR

Q.3 Consider the above mentioned Supplier-Parts-Catalog schema. State what the following queries compute: 10

1. $\pi_{sname}(\sigma_{colour='red'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier)$
2. $\pi_{sname}(\pi_{sid}(\sigma_{colour='red'}(Part) \bowtie \sigma_{cost < 100}(Catalog)) \bowtie Supplier)$
3. $\pi_{sname}(\sigma_{colour='red'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier) \cap \pi_{sname}(\sigma_{colour='green'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier)$
4. $\pi_{sid}(\sigma_{colour='red'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier) \cap \pi_{sid}(\sigma_{colour='green'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier)$
5. $\pi_{sname}(\pi_{sid.sname}(\sigma_{colour='red'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier) \cap \pi_{sid.sname}(\sigma_{colour='green'}(Part) \bowtie \sigma_{cost < 100}(Catalog) \bowtie Supplier))$

Q.4A An E-R diagram can be viewed as a graph. What do the following mean in terms of the structure of an enterprise schema? 5

- a) The graph is disconnected.
- b) The graph has a cycle.

Q.4B What benefit does rigorous two-phase locking provide? How does it compare with other forms of two-phase locking? 5

OR

Q.4B Describe each of the following locking protocols: 5

- a) two-phase locking,
- b) Conservative two-phase locking.

Q.5A List two advantages and two disadvantages of each of the following strategies 10

for storing a relational database:

- a. Store each relation in one file.
- b. Store multiple relations (perhaps even the entire database) in one file.

OR

Q.5B A PARTS file with *PartNumber* as [hash] key field includes records with the following *PartNumber* values: 10

23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50, 69, 75, 8, 49, 33, 38.

- (a) Suppose the search field values are inserted in the given order in a B+-tree of order $n=4$; show how the tree will expand and what the final

tree looks like.

- (b) Load the above records into expandable hash files based on extendible hashing. Show the structure of the directory at each step. Show the directory at each step, and the global and local depths. Use the hash function $h(K) = K \bmod 8$.

Q.6A Consider the following two transactions:

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T1: read(A);
 read(B);
 if A = 0 then B := B + 1;
 write(B).
 T2: read(B);
 read(A);
 if B = 0 then A := A + 1;
 write(A).

Add lock and unlock instructions to transactions T1 and T2, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

Q.6B What is a recoverable schedule? Why is recoverability of schedules desirable? Are there any circumstances under which it would be desirable to allow non-recoverable schedules? Explain your answer.

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OR

Q.6B What is a cascadeless schedule? Why is cascadelessness of schedules desirable? Are there any circumstances under which it would be desirable to allow non-cascadeless schedules? Explain your answer.

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Q. 7, 8 and 9 are based on following case study:

Consider the AIRLINE relational database schema shown below. Specify the following queries in relational algebra:

- For each flight, list the flight number, the departure airport for the first leg of the flight, and the arrival airport for the last leg of the flight.
- List the flight numbers and weekdays of all flights or flight legs that depart from Houston Intercontinental Airport (airport code 'IAH') and arrive in Los Angeles International Airport (airport code 'LAX').
- List the flight number, departure airport code, scheduled departure time, arrival airport code, scheduled arrival time, and weekdays of all flights or flight legs that depart from some airport in the city of Houston and arrive at some airport in the city of Los Angeles.
- List all fare information for flight number 'CO197'.
- Retrieve the number of available seats for flight number 'CO197' on '2018-10-09'.

Q.7 Design a conceptual schema and draw an ER diagram for Airlines. Be sure to indicate all key and cardinality constraints and any assumptions that you make. Identify any constraints that you are unable to capture in the ER diagram

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Q.8 Map E-R designed in Relational Table.

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Q.9 (a) List Functional Dependencies in Each Table and Normalize the Relation.
 (b) Prepare detailed Data Dictionary.

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