

Name :

Roll No. :

Invigilator's Signature :

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2011

DATABASE MANAGEMENT SYSTEM

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: $10 \times 1 = 10$

i) One of the shortcomings of file system is

- a) data availability b) fixed records
- c) sequential records d) lack of security.

ii) A trigger is

- a) a statement that enables to start any DBMS
- b) a statement that is executed by the user when debugging an application program
- c) a condition the system tests for the validity of the database user
- d) a statement that is executed automatically by the system on a modification.

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- iii) One difference between TRUNCATE and DELETE command is
- TRUNCATE deletes the table but DELETE only deletes records
 - DELETE operation can be rolled back, but TRUNCATE operation cannot be rolled back
 - TRUNCATE can be rolled back but DELETE cannot be rolled back
 - TRUNCATE is a DML command but DELETE is a DDL command.
- iv) Which defining a numeric number field that can hold 3 digits before the decimal point and 3 digits after the decimal points, the width would be given as
- 6
 - 7
 - 8
 - 3.
- v) Advantage of locking algorithms in concurrent execution of DB transaction is
- deadlock
 - concurrency
 - consistency
 - none of these.
- vi) Consider the schema $R = (S, T, U, V)$ and the dependencies $S \rightarrow T, T \rightarrow U, U \rightarrow V$ and $V \rightarrow S$. Let $R = (R1 \text{ and } R2)$ be a decomposition such that $R1 \cap R2 = \emptyset$. The decomposition is :
- Not in 2NF
 - In 2NF but not in 3NF
 - In 3NF but not in 2NF
 - In both 2NF and 3NF.

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vii)	EMPNO	ENAME	SAL
	A822	RAMASWAMY	3500
	A812	NARAYAN	5000
	A973	UMESH	2850
	A500	BALAJI	5750

Use these data for the following questions.

Select SAL from EMP E1 where $3 > (\text{Select count} (*) \text{ from Emp E2 where } E1 \cdot \text{SAL} > E2 \cdot \text{SAL})$ will retrieve

- a) 3500,5000,2500 b) 5000,2850
c) 2850,5750 d) 5000,5750.

viii) The information about data in a database is called

- a) meta data b) tera data
c) hyper data d) none of these.

ix) $R = \{I, J, K, L\}$ $F = \{I \rightarrow K, IL \rightarrow J, JK \rightarrow L, L \rightarrow K\}$, The candidate keys are

- a) J and K b) JK
c) Only I d) JK and JL.

x) Consider the primary key foreign key relationship between Employee and Department table via Dept ID column. If you try to delete a department in Department table which is referred in Employee table, Oracle by default does not allow this. This is known as ON DELETE.....

- a) SET CASCADE b) SET DEFAULT
c) RESTRICT d) SET NULL.

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GROUP – B**(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. a) What is the difference between a database and a table ?
 b) Why are entity integrity and referential integrity important in a database ? $2 + 3$
3. a) What is lossless decomposition ?
 b) Draw a functional dependency diagram (FD diagram) that is in 3NF but not in BCNF. Decompose that FD diagram into BCNF.
4. Design a Generalization-Specialization hierarchy for a motor-vehicle sales company. The company sells motor-cycles, passenger cars, vans, buses. Justify your placement of attributes at each level of the hierarchy. Explain why they should not be placed at a higher or lower level.
5. What is the difference between Primary Index, Secondary Index and Clustering Index ?
6. What are the recovery implications of :
 a) forcing buffers to the database at COMMIT ?
 b) never physically writing buffers to the database prior to COMMIT ? $2\frac{1}{2} + 2\frac{1}{2}$

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GROUP – C**(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7. a) Hotel (Hotel No, Hotel Name, Address)
 Room (Room No, Hotel No, Type, Price_pn)
 Booking (Hotel No, Guest No, Date From, Date To, Room No)
 Guest (Guest No, Guest Name, Guest Address)
 where the underlined column names are primary key.
 Write down expressions in relational algebra for the following queries :
- i) list all the hotels which are situated in Kolkata
 - ii) list all single rooms with a charge below Rs. 1000 per night
 - iii) list the names of all guest who are going to stay at ITC hotel from 25th December to 1st January.
 - iv) list the price per night and type of all rooms at Grand Hotel. 6
- b) What do you mean by composite attribute and derived attribute ? Give example. 2
- c) Some of the entities relevant to a technical university are given below :
- i) STUDENT and ENGG-BRANCH (students register for engg branches)
 - ii) BOOK and BOOK-COPY (books have copies)

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- iii) ENGG-BRANCH and SECTION (branches have section)
- iv) SECTION and CLASS-ROOM (sections are scheduled in classrooms)
- v) FACULTY and ENGG-BRANCH (faculty teaches in a particular branch)

For each of them, indicate the type of relationship existing among them (for example, one-to-one, one to-many or many-to-many). Draw a relationship diagram for each of them. 5

- d) An E-R diagram can be viewed as a graph. What do the following means in terms of the structure of an enterprise schema ?

- i) The graph is disconnected
- ii) The graph is cycl c 2

8. a) Compute the closure of the following set F of functional dependencies for relational scheme.

$R = (A \ B \ C, D, E)$
 $A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A$ 3

- b) Consider the relation $R = \{ A, B, C, D, E, F, G, H, I, J \}$ and the set of functional dependencies :

$F = \{ AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ \}$
 Decompose R into 3NF. 5

- c) What do you mean by lossless and dependency preserving decomposition ? 4
- d) What is MDV ? Explain with an example. 3

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9. a) Consider relation $R (A, B, C)$ and a set of functional dependencies $F = \{ A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C \}$. Compute the canonical cover for F . 6
- b) Define BCNF. How does it differ from 3NF ? Why is BCNF considered to be stronger than 3NF ? 4
- c) Draw a functional dependency diagram that is in 3NF but not in BCNF. Decompose that FD diagram into BCNF. 3
- d) Explain candidate key with an example 2
10. a) State Two-phase Commit protocol and discuss the implications of a failure on the part of
- i) the coordinator
- ii) a participant, during each of the two phases. 4
- b) Describe the wait-die and wound-wait protocols for deadlock prevention. 2
- c) Define three concurrency problems : dirty read, non-repeatable read, phantoms. 3
- d) Let T_1 , T_2 and T_3 be transactions that operate on the same data items A, B and C. Let $r_1 (A)$ mean that T_1 reads A, $w_1 (A)$ means that T_1 writes A and so on for T_2 and T_3 . Consider the following schedule
- SI : $r_2 (C), r_2 (B), w_2 (B), r_3 (B), r_3 (C), r_1 (A), w_1 (A), w_3 (B), w_3 (C), r_2 (A), r_1 (B), w_1 (B), w_2 (A)$
- Is the schedule serializable ? 3
- e) What are the roles of the Analysis, Redo and Undo phases in the recovery algorithm 'ARIES'. 3

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11. a) State the difference between the following in brief :
Primary Index versus Secondary Index.
- b) What is blocking factor ? Explain the difference between B-tree and B+tree indexing with proper example.
- c) Explain deferred update technique for recovery with its advantages and disadvantages.
- d) What are the causes of bucket overflow in a hash file organization ?
- e) Construct a B+ tree for the following set of key values :
(2, 3, 5, 7, 11, 17, 19, 23, 29, 3)
Assume that the tree is initially empty and values are added in ascending order. Construct B+ -trees for the cases where the numbers of pointers that will fit in one node is as follows
- i) Four
 - ii) Six
 - iii) Eight
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