

**AMIETE – CS/IT (OLD SCHEME)**

Time: 3 Hours

**DECEMBER 2011**

Max. Marks: 100

**NOTE: There are 9 Questions in all.**

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

- a. A database schema is specified by a set of definitions expressed by a special language called as \_\_\_\_\_.
- (A) Data Definition language                      (B) Data Manipulation language  
(C) Data Control language                      (D) Data Query language
- b. A \_\_\_\_\_ is set of one or more attributes, taken collectively that allow us to identify uniquely an entity in the entity set
- (A) Candidate key                                      (B) Primary key  
(C) Super key    (D) Weak key
- c. The clause that corresponds to the Cartesian-product operation of the relational algebra is
- (A) select    (B) from  
(C) where    (D) none of these
- d. If  $\alpha$  is a set of attributes and  $\beta \subseteq \alpha$ , then  $\alpha \rightarrow \beta$  holds. This rule is known as
- (A) Union rule    (B) Transitivity rule  
(C) Decomposition rule                              (D) Reflexivity rule
- e. Which RAID level is also known as block-interleaved parity organization?
- (A) RAID level 0    (B) RAID level 3  
(C) RAID level 4.    (D) RAID level 5
- f. The organization in which the records of several different relations can be stored in the same file refers to.
- (A) Hashing file organization                      (B) Clustering file organization  
(C) Heap file organization                              (D) B tree file organization



**Code: AC14 / AT11      Subject: DATABASE MANAGEMENT SYSTEMS**

- Q.4** a. Consider the following employee database, where the primary keys are underlined.  
*employee* (*employee\_name*, *street*, *city*)  
*works* (*employee\_name*, *company\_name*, *salary*)  
*company* (*company\_name*, *city*)  
*manages* (*employee\_name*, *manager\_name*)
- Give an expression in SQL for each of the following queries.  
 (i) Find the names of all employees who work for ABCL Corporation.  
 (ii) Find all employees in the database who live in the same cities as the companies for which they work.  
 (iii) Find those companies whose employees earn a higher salary, on average, than the average salary at ABCL Corporation.  
 (iv) Give all managers of ABCL Corporation a 10 percent raise.  
 (v) Delete all tuples in the *works* relation for employees of BOB Corporation. **(10)**
- b. Consider the following account schema.  
*account*(*branch\_name*, *account\_number*, *balance*)  
 Write an SQL query, without using a **with** clause, to find all branches where the total account deposit is less than the average total account deposit at all branches,  
 (i) Using a nested query in the **from** clause.  
 (ii) Using a nested query in a **having** clause. **(6)**
- Q.5** a. Explain the normal form called as Boyce-Codd (BCNF)? Prove that any relation schema with two attributes is in BCNF? **(8)**
- b. What is referential integrity? What is the need for triggers and how are they implemented in SQL? Give Example. **(8)**
- Q.6** a. Discuss Byte-String Representation technique for implementing variable-length records? **(8)**
- b. Since indices speed-up query processing, why might they not be kept on several search keys? List as many reasons as possible. **(4)**
- c. Discuss the various cost components for Query execution? **(4)**
- Q.7** a. What role Sorting play in database systems? How sorting accomplished in database system? Discuss the different phases of external sorting? **(8)**
- b. Consider the following two transactions:  
 $T_1$ : read(*A*);  
       read(*B*);  
       **if** *A* = 0 **then** *B* := *B* + 1;  
       write(*B*).  
 $T_2$ : read(*B*);  
       read(*A*);  
       **if** *B* = 0 **then** *A* := *A* + 1;  
       write(*A*).

**Code: AC14 / AT11      Subject: DATABASE MANAGEMENT SYSTEMS**

---

Let the consistency requirement be  $A = 0 \vee B = 0$ , with  $A = B = 0$  the initial values.

- (i) Show that every serial execution involving these two transactions preserves the consistency of the database.
- (ii) Show a concurrent execution of  $T_1$  and  $T_2$  that produces a nonserializable schedule.
- (iii) Is there a concurrent execution of  $T_1$  and  $T_2$  that produces a serializable schedule? (3+3+2)

**Q.8** a. What is “Two-Phase locking protocol”? Explain with the help of example of a schedule, how the protocol ensures a schedule to be conflict-serializable, but not Cascade-less? (8)

b. Define Deadlock? What are the necessary four conditions for a deadlock to occur? Discuss the different methods that can be used for deadlock prevention? (8)

**Q.9** Explain the following:

- (i) Functions of Database Administrator (DBA)
- (ii) Embedded SQL
- (iii) Loss-Less Join decomposition
- (iv) ACID properties (4×4)