

**AMIETE – CS/IT {NEW SCHEME}**

Time: 3 Hours

**DECEMBER 2014**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

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

- **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. The characteristics that allow program data independence and program operation independence is called:
- (A) Data abstraction                      (B) Abstract operation  
(C) Conceptual representation        (D) Data Independence
- b. If a relation schema may have more than one key then each of the key is
- (A) Primary key                            (B) Candidate Key  
(C) Super Key                              (D) Foreign Key
- c. Constraints that cannot be directly expressed in schemas of data model are known as
- (A) Explicit Constraints                  (B) Implicit Constraints  
(C) Schema based Constraints        (D) Semantic Constraints
- d. The operation which considered as a Unary relational operation in relational algebra is \_\_\_\_\_
- (A) Project                                  (B) Union  
(C) Join                                        (D) Intersection
- e. If multiple transactions are allowed to execute concurrently then which of the technique is not applicable?
- (A) Log –based technique  
(B) Shadow paging technique  
(C) Log –based technique and Shadow paging technique  
(D) None of these

- f. What is the worst case time complexity of Bubble sort? If we consider that  $n$  elements are to be sorted.
- (A)  $O(1)$  (B)  $O(\log_2 n)$   
(C)  $O(n)$  (D)  $O(n^2)$
- g. Concurrent transaction execution proceed without conflicting are ensured by
- (A) Transaction manger (B) Data base administrator (DBA)  
(C) Query processor (D) Storage manager
- h. Null values in SQL indicate
- (i) Zero value  
(ii) Value is un-known  
(iii) Value does not exist
- Which statement (s) is/are correct
- (A) Only (iii) (B) (ii) and (iii)  
(C) (i) and (ii) (D) All of these
- i. In a database system, a recovery scheme is responsible for
- (A) For the detection of failures (B) For the restoration of the database  
(C) Both (D) None of these
- j. Which of the following fact is true about Distributed Concurrency Control?
- (A) Distributed Concurrency Control Based on a Distinguished Copy of a Data Item  
(B) Distributed Concurrency Control Based on Voting  
(C) Distributed Recovery  
(D) all of the above

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**Answer any FIVE Questions out of EIGHT Questions.  
Each question carries 16 marks.**

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- Q.2** a. Explain the different roles of database administrators. (6)
- b. How Specialization is differing from generalization? Explain with the suitable example. (4)
- c. Define the following terms associated with ER Model: (6)
- (i) Simple and Composite Attribute  
(ii) Single Valued & Multi valued attribute  
(iii) Primary Key and Foreign Key

- Q.3** a. What do you mean by Referential Integrity? Define it in the terms of: (8)  
(i) Referential Integrity in the ER Model  
(ii) Referential Integrity in SQL
- b. What is the difference between Natural Join and Outer Join? Explain with the help of Relational Algebra. (8)
- Q.4** a. A Database Schema is defined as: (10)
- Engineer (EngineerID, eName, DOB, Designation, Income, Dept\_ID)  
PROJECT (Project\_No., ProjectName, Budget, Dept\_ID)  
DEPARTMENT (Dept\_ID, DeptName, MGR EngineerID)  
WorksOn (EngineerID, Project\_No., Duty, Hours)
- Based on the above, answer the following Questions:
- (i) Write an SQL query that returns the Engineers (IDs and Name only) who have a title of 'SWD' or 'SWT' and earn more than Rupees Sixty Five Thousands.
- (ii) Write an SQL query that returns the Engineers (name only) in department 'SWD 2' ordered by decreasing income.
- (iii) Write an SQL query that returns the Engineer Name, Department Name, and Engineer Designation.
- (iv) Write an SQL query that returns the Engineer IDs and Incomes of all Engineers in the 'SW Testing' department ordered by descending income.
- (v) Write an SQL query that returns the Engineer name, Project name, Engineer Designation and Hours for all Works On records.
- b. List out the main approaches to database programming. What are the advantages and disadvantages of each approach? (6)
- Q.5** a. Define the concept of Functional Dependencies. List out the main characteristics of functional dependencies that are used when normalizing a relation. (4)
- b. Explain in detail the 1NF (first normal form), 2NF (second normal form) and 3NF (third normal form). Also give suitable examples for explanation. (6)
- c. What do you understand by multi-valued dependency? How this concept relates to 4NF? (6)
- Q.6** a. Briefly describe the following: (6)  
(i) Distribution Transparency  
(ii) Fragmentation Transparency  
(iii) Replication Transparency

- b. What do you mean by data replication and allocation in DDBMS? Explain by appropriate example. (6)
- c. List out the problems occurred in the distributed DBMS for concurrency control and recovery purposes. (4)
- Q.7** a. What are the techniques for concurrency control? Explain in brief two phase locking technique. (6)
- b. Explain the following terms with significant examples: (4)
- (i) A read only transaction
- (ii) An aborted transaction
- c. What do you understand by the terms deadlock and starvation in database transaction? Explain the different approaches to dealing these problems. (6)
- Q.8** a. Explain the UNDO/REDO and UNDO/NO-REDO algorithms for recovery with immediate update. Develop an outline or procedure for an UNDO/REDO recovery algorithm Based on Immediate update for a Multiuser environment. (8)
- b. Describe the write-ahead logging protocol. Also mention the actions taken by the recovery manager during check-pointing. (8)
- Q.9** a. Distinguish between discretionary access control (DAC) and mandatory access Control (MAC). (4)
- b. List out the types of privileges at the account level and those at the relation level. (4)
- c. What is the goal of encryption? Give an example of an encryption algorithm and explain how it works. (8)