Code: AC61/AT61   Subject: DATABASE MANAGEMENT SYSTEMS

AMIETE – CS/IT (NEW SCHEME)

Time: 3 Hours | **JUNE 2012** | 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 characteristic that allows program-data independence and program-operation independence is called _____.

   (A) Data Isolation   **(B)** Data Abstraction
   (C) Data Representation   **(D)** Meta-data

b. Entity types that do not have key attributes of their own is

   (A) Weak entity types.   **(B)** Regular entity types.
   (C) Strong entity types.   **(D)** Key entity types.

c. Name the operation that is used to change the values of one or more attributes in a tuple or tuples of some relation R?

   (A) Update   **(B)** Change
   (C) Insert   **(D)** Delete

d. A table can have only one

   (A) Unique key   **(B)** Alternate key
   (C) Primary key   **(D)** Secondary key

e. The clause in SQL that specifies that the query result should be sorted in ascending or descending order based on values of one or more columns is

   (A) Sort by   **(B)** Group by
   (C) Order by   **(D)** List by

f. If both the functional dependencies $X \rightarrow Y$ and $Y \rightarrow X$ hold for two attributes X and Y then the relationship between X and Y is

   (A) 1 : 1   **(B)** M : 1
   (C) 1 : M   **(D)** None of these

g. The process of selecting the most efficient query evaluation plan for a query is known as

(A) Query optimization   (B) Query processing
(C) Parsing   (D) Translation

h. The protocol that ensures that the resulting schedules will be conflict-serializable, cascade-less and recoverable is

(A) Graph-Based locking protocol   (B) Strict-Two-Phase locking protocol
(C) Time-Stamp-Ordering protocol   (D) Multiple-Granularity protocol

i. A _____ has an index entry for every search key value in the data file.

(A) Dense index   (B) Sparse index
(C) Cluster index   (D) Primary index

j. UNDO/NO-REDO recovery algorithm is called as

(A) Recovery technique based on immediate update.
(B) Recovery technique based on deferred update.
(C) Shadow paging.
(D) Cascading rollback.

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

Q.2 a. What are the different types of database end users? Discuss the main activities of each. **(6)**

b. A university registrar's office maintains data about the following entities:
(i)   courses, including number, title, credits, syllabus, and prerequisites;
(ii) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;
(iii) students, including student-id, name, and program; and
(iv) instructors, including identification number, name, department, and title.
Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.
Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints. **(10)**

Q.3 a. Explain the following relational algebra operations with their notations by suitable example
(i)   INTERSECTION   (ii) PROJECT
(iii) ASSINGNMENT   (iv) SELECT **(8)**

b. Let $R = (A, B, C)$, and let r_1 and r_2 both be relations on schema R. Give an expression in the domain relational calculus that is equivalent to each of the following:
(i) $\Pi_A(r_1)$ (ii) $\sigma_{B=17}(r_1)$
(iii) $r_1 \cup r_2$ (iv) $r_1 \cap r_2$
(v) $r_1 - r_2$ **(8)**

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(employee_name, city)
managers(employee_name, manager_name)

Give an expression in SQL for each of the following queries:-

(i)   Find the names and cities of residence of all employees who work for XYZ Corporation.

(ii) Find all employees in the database who live in the same cities and on the same streets as do their managers.

(iii) Modify the database so that Jones now lives in Newtown.

(iv) Find all employees who earn more than the average salary of all employees of their company.

(v)   Give all employees of XYZ Corporation a 10 percent raise.   **(10)**

b. Discuss the different approaches to database programming. What are the advantages and disadvantages of each approach?   **(6)**

Q.5 a. Consider a relation schema $R = (A, B, C, D, E)$ with the following set of functional dependencies holding on it

$A \rightarrow BC$
$CD \rightarrow E$
$B \rightarrow D$
$E \rightarrow A$

Determine closure F^+ and list the candidate keys for R.   **(8)**

b. Define decomposition. State the properties that must be satisfied by a relation R to be decomposed into a set of relations.   **(8)**

Q.6 a. What are the causes of bucket overflow in a hash file organization? What can be done to reduce the occurrence of bucket overflows?   **(8)**

b. Explain dynamic multilevel indexes using B-Trees and B^+-Trees.   **(8)**

Q.7 a. With the help of a diagram discuss the different steps used by a DBMS to process, optimize, and execute high-level query.   **(8)**

b. What is meant by cost-based query optimization? Discuss the various cost components for Query execution.   **(8)**

Q.8 a. Draw a state diagram, and discuss the typical states that a transaction goes through during execution.   **(8)**

b. Explain two-phase locking technique for concurrency control. Give an illustration.   **(8)**

Q.9 a. Discuss the different steps of ARIES recovery procedure.   **(8)**

b. Describe database recovery technique. Also, discuss the two main techniques for recovery from noncatastrophic transaction.   **(8)**