ROLL NO. _____

ALCCS - NEW SCHEME

Code: CT13 **Subject: DATABASE MANAGEMENT SYSTEMS**
Time: 3 Hours **Max. Marks: 100**

AUGUST 2011

NOTE:

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. What are procedural and non procedural languages? Which of them are easier to learn and use? Explain your answer.

b. Explain differences between disjoint and overlapping constraints in generalization / specialization in E-R diagram.

c. Define the following integrity constraints:
(i) Domain (ii) Key
(iii) Entity (iv) Referential Integrity

d. Given a relation R = {A, B, C, D, E, H} and having the following FDs F = {{A → BC}, {C, D → E}, {E → C}, {D → A, E, H}, {A, B, H → B, D}, {D, H → B, C}}. Find the candidate keys for relation R.

e. Discuss the basic Armstrong Axioms for functional dependency.

f. Differentiate between physical and logical data independence. Which of them is easy to achieve?

g. Discuss the meaning of existential qualifier and universal quantifier in the context of Relational Algebra with the help of an example. **(7 × 4)**

Q.2 a. Define Relational completeness. Express Natural Join and Division operator in terms of basic relational algebra operations. **(4)**

b. Give the difference between:
(i) Strong and weak entity set.
(ii) Super key, Candidate key and Primary key.
(iii) Condition-defined and user-defined constraints in an ER diagram.
(iv) 3NF and BCNF. **(8)**

c. Discuss Multivalued dependency and Join dependency. Why they are not desirable in a relation. Justify. **(6)**

Q.3 a. For the following relations
Members (mid, name, design, age)
Books (Bid, Btitle, BAuthor, Bpublisher, Bprice)
Reserves (mid, Bid, date)
Where Bid is book identification, Btitle is Book title, Bpublisher is book publisher, Bprice is Book price, mid is Members identification, and Design is designation

Write the following queries in Relational Algebra:
(i) List the title of books reserved by professors older than 45 years
(ii) Find ids of members who have not reserved books costing more than Rs. 500.
(iii) Find the author and title of books reserved on 27-May-2007.
(iv) Find the names of members who have reserved all the books. **(12)**

b. Discuss the anomalies in a relation that are addressed by Normalization. **(6)**

Q.4 a. For the following relations:
Student(Name,student_number,class,major)
Course(course_name, course_number, credit_hour, department)
Section(section_identifier,course_number,semester,year,instructer)
Grade report(student_number, section_identifier, grade)
Prerequisite(course_number, Prerequisite_number)

Specify the following queries in SQL:
(i) Retrieve the names of all senior students majoring in 'COSC' (computer science).
(ii) Retrieve the names of all courses taught by professor King in 85 and 86.
(iii) For each section taught by professor King, retrieve the course number, semester, year, and number of students who took the section.
(iv) Retrieve the name and transcript of each senior student (Class=5) majoring in COSC. Transcript includes course name, course number, credit hours, semester, year and grade for each course completed by the student.
(v) Retrieve the names and major departments of all straight A students (students who have a grade of A in all their courses).
(vi) Retrieve the names and major departments of all students who do not have any grade of A in any of their courses. **(15)**

b. State whether the following conclusions are true or false:
(i) NOT (P(x) OR Q(x)) $\Rightarrow$ (NOT (P(x)) AND (NOT (Q(x))))
(ii) NOT ($\exists$ x) (P(x)) $\Rightarrow$ $\forall$ x (NOT (P(x)))
(iii) ($\exists$ x) (P(x)) $\Rightarrow$ $\forall$ x (P(x)). **(3)**

Q.5 a. Discuss Strict Two phase locking protocol and conservative two phase locking protocol. **(4)**

b. Discuss the purpose of check points in database recovery. **(4)**

c. Verify whether the two sets of FDs for a relation R (A, B, C, D, E) given below are equivalent?
(i) $A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E$
(ii) $A \rightarrow BC, D \rightarrow AE$ **(4)**

d. Consider the universal relation R = {A, B, C, D, E, F, G, H, I} and the set of functional dependencies F = { {A, B} -> {C}, {A} -> {D, E}, {B} -> {F}, {F} -> {G, H}, {D} -> {I, J}}. What is the key for R? Decompose R into 2NF, and then 3NF relations. **(6)**

Q.6 a. Discuss view serializability of schedules. **(4)**

b. Which of the following schedules is (conflict) serializable? For each serializable schedule, determine the equivalent serial schedules.
(i) $r_1(X); r_3(X); w_1(X); r_2(X); w_3(X)$
(ii) $r_1(X); r_3(X); w_3(X); w_1(X); r_2(X)$
(iii) $r_3(X); r_2(X); w_3(X); r_1(X); w_1(X)$
(iv) $r_3(X); r_2(X); r_1(X); w_3(X); w_1(X)$ **(8)**

c. Consider schedules S_1, S_2, and S_3 below. Determine whether each schedule is strict, cascadeless, recoverable, or nonrecoverable. (Determine the strictest recoverability condition that each schedule satisfies.)

S_1: $r_1(x); r_2(z); r_1(z); r_3(x); r_3(y); w_1(x); c_1; w_3(y); c_3; r_2(y); w_2(z); w_2(y); c_2$

S_2: $r_1(x); r_2(z); r_1(z); r_3(x); r_3(y); w1(x); w_3(y); r_2(y); w_2(z); w_2(y); c_1; c_2; c_3;$

S_3: $r_1(x); r_2(z); r_3(x); r_3(z); r_3(y); r_3(y); w_1(x); w_2(z); w_3(y); w_2(y); c_3; c_2;$ **(6)**

Q.7 Write short notes on any **<u>THREE</u>** of the following:

(i) Distributed Databases.
(ii) Web Databases.
(iii) Shadow Paging.
(iv) Heuristic based optimization. **(6×3)**