B.TECH / IT /5TH SEM/ INFO 3104/2017
DATABASE MANAGEMENT
(INFO 3104)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking **at least one** from each group.*

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Fifth Normal form is concerned with
(a) Functional dependency   (b) Multivalued dependency
(c) Join dependency   (d) Domain-key.

(ii) A domain integrity constraint is:
(a) primary key constraint   (b) Check constraint
(c) foreign key constraint   (d) None of the above.

(iii) Relation R=(A, B, C, D) with AB as primary key. Choose one FD such that R should be in 1NF but not in 2NF.
(a) AB -> C   (b)AB -> D   (c) A -> D   (d)AB-> CD.

(iv) The part of a database management system which ensures that the data remains in a consistent state is
(a) authorization and integrity manager   (b) buffer manager
(c) transaction manager   (d) file manager.

(v) A cascadeless schedule is also
(a) revertable   (b) recoverable
(c) both   (d) none of the above.

(vi)   Wait-die scheme for preventing deadlock is a
(a) Preemptive Scheme based on time-stamp
(b) Nonpreemptive scheme
(c) Preemptive Scheme
(d) Nonpreemptive Scheme based on timestamp

(vii) A superkey set consists of {AB, A, BC, ABC}.Out of this the minimal super keys are
(a) {A, BC, AB}   (b) {ABC}   (c) {A, AB}   (d) {A, BC}.

(viii) Clustering index is a ----------------------- index
(a) Sparse   (b) Dense   (c)Hash   (d)None of them.

(ix) Checkpoints are a part of
(a) Recovery measures   (b) Security measures
(c) Concurrency measures   (d) Authorization measures.

(x) Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock?
 I. Two-Phase locking   II. Time-Stamp ordering
(a) I only   (b) II only   (c) Both I and II
(d) Neither I nor II.

Group - B

2. (a) Explain logical independence vs. physical independence with respect to database system. What is the advantage of DBMS over file processing system?

  (b) Site an example of Weak Entity Set and its relationship with a strong entity set by using ER-notation. Convert the ER schema of your example to its corresponding tabular representation.

(3 + 3) + 6 = 12

3. (a) Design a database for MEDICAL CLINIC located in Mangalore. The clinic has a number of regular patients and new patients come to the clinic regularly. Patients make appointments to see one of the doctors. Several doctors attend the clinic and they each have their own hours when they attend the clinic. Some doctors are general practitioners while others are specialist (like, cardiologists, dermatologists, endocrinologists etc). Doctors' hours are defined and fixed by each doctor but can be changed, if necessary. Different doctors may charge different fees. Doctors send patients to other clinics of X-rays and blood tests. These reports are sent from the clinics to doctors' electronically. Doctors write medical certificates. Patients have families and the family relationships are important. Medical records of each patient need to be maintained. Information on prescriptions, insurance, allergies, etc. needs to be maintained.
Design an ER model for the MEDICAL CLINIC.

(b) Site an example of many to many relationship between two entity sets, using ER model. Convert the schema to its corresponding tabular representation.

8 + 4 = 12

Group - C

4. (a) Consider the following schema:
Airport (code, name, city, country)
Flight (number, airline, from_airport_code, to_airport_code)
Reservation(flight_number, seat_number, date, passenger_name)
Answer the following using relational algebra:
(i) List the flight numbers of flights that take off from India
(ii) List the passenger who are on flight number 'SA 747'.
(iii)List all the flight information for Indian Airlines and Jet Airways.

(b) Explain division operation in Relational Algebra with a proper example.

(4 + 3 + 2) + 3 = 12

5. (a) Write a PL/SQL code to accept the 3 sides of a triangle, then insert the sides value along with the type of triangle (isosceles /equilateral /scalene), in a relation named Triangle (side1, side2, side3, type).

(b) A bank has set rules for dealing with negative account balance, by setting the account balance as zero and creating a loan in the amount of overdraft. An overdraft is an event where a customer's withdrawal amount exceeds the available account balance. Write a trigger such that once the event happens, a row in the loan table gets inserted, with values loan_no and loan-amount (which is equal to the overdrawn amount).

6 + 6 = 12

Group - D

6. (a) List the Armstrong's axioms for functional dependencies. What do you understand by soundness and completeness of these axioms?

(b) Given R {ABCD} and a set F of functional dependencies on R given as:
F ={AB→C,AB→D,C→A, D→B}.
Find any two candidate keys of R. Show each step. In what normal form is R? Justify.

6 + 6 = 12

7. (a) "Every candidate key is a superkey". Justify with example for or against. What is a key attribute?

(b) Find the canonical form of the following set of FD's given, explaining each step.
i) $A \rightarrow BC, AB \rightarrow D, AC \rightarrow D$
ii) $A \rightarrow B, A \rightarrow B, B \rightarrow C, AB \rightarrow C$

(4 + 2) + (3 + 3) = 12

Group - E

8. (a) Explain with examples, The Lost Update problem and Dirty Read problem.

(b) Which of the following schedule is conflict serializable? Explain your answer.
For each of the following serializable schedule, determine the equivalent serial schedule.
i) r1(x); r3(x); w1(x); r2(x); w3(x);
ii) r3(x); r2(x); w3(x); r1(x); w1(x);

(3 + 3) + 6 = 12

9. (a) Construct a B+ tree with the following elements.
10, 30, 1, 3, 77, 34, 90, 67,2, 8, 11, 89
$p = 3$ and $p_{leaf} = 2$.

(b) Consider the following two transactions:-

T1 : read (A);
read (B);
B = A + B;
write (B)
T2 : write (A)
read (B)

Add lock and unlock instructions so that the transactions T1 and T2 observe two-phase locking protocol. Is it deadlock free?

6 + 6 = 12