DATABASE MANAGEMENT SYSTEMS
(CSEN 3102)

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) Given the basic ER models, which of the following is **INCORRECT**?
(a) An attribute of an entity can have more than one value
(b) An attribute of an entity can be composite
(c) In a row of a relational table, an attribute can have more than one value
(d) In a row of a relational table, an attribute can have exactly one value or a NULL value.

(ii) Given the following relation instance

X	Y	Z
1	4	2
1	5	3
1	6	3
3	2	2

Which of the following functional dependencies are satisfied by the instance?
(a) XY → Z and Z→ Y (b) YZ → X and Y → Z
(c) YZ → X and X → Z (d) XZ → Y and Y → X.

(iii) The attribute AGE is calculated from DATE_OF_BIRTH. The attribute AGE is
(a) Single valued (b) Multi valued (c) Composite (d) Derived.

(iv) _____ is a special type of integrity constraint that relates two relations & maintains consistency across the relations.
(a) Entity Integrity Constraints (b) Referential Integrity Constraints
(c) Domain Integrity Constraints (d) Domain Constraint.

(v) Given the basic ER and relational models, which of the following is INCORRECT?
(a) An attribute of an entity can have more than one value.
(a) An attribute of an entity can be composite.
(c) In a row of a relational table, an attribute can have more than one value.
(d) In a row of a relational table, an attribute can have exactly one value or a NULL value.

(vi) Which of the following statements are TRUE about an SQL query?
P: An SQL query can contain a HAVING clause even if it does not have a GROUP BY clause.
Q: An SQL query can contain a HAVING clause only if it has a GROUP by clause.
R: All attributes used in a GROUP BY clause must appear in the SELECT clause.
S: Not all attributes used in a GROUP BY clause need to appear in the SELECT clause.
(a) P and R (b) P and S (c) Q and R (d) Q and S.

(vii) Why does the following statement fail?
CREATE TABLE FRUITS&VEGETABLES (NAME VARCHAR2 (40));
(a) The table should have more than one column defined.
(b) NAME is a reserved word, which cannot be used as a column name.
(c) The table name is invalid.
(d) Column name cannot exceed 32 characters.

(viii) Which is not an ACID property?
(a) Atomicity (b) Durability (c) Consistency (d) Integrity.

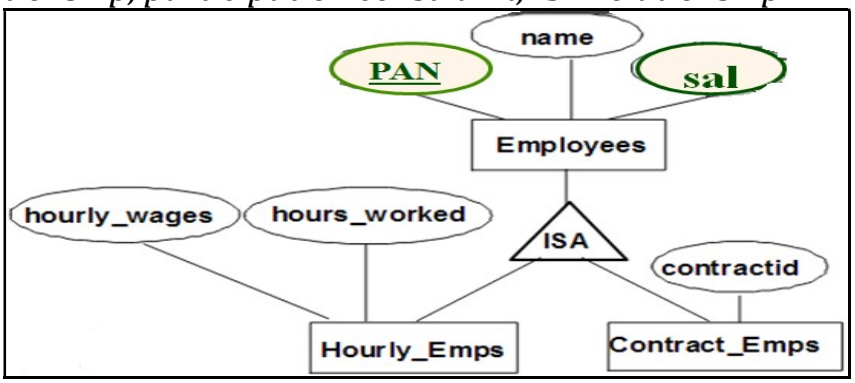
(ix) A transaction that completes its execution is said to be
(a) Committed (b) Aborted (c) Rolled back (d) Failed.

(x) Which of the following is **not** a property of transactions?
(a) Atomicity (b) Concurrency (c) Isolation (d) Durability.

Group – B

2. (a) Why would you choose a database system instead of simply storing data in operating system files?

(b) Based on the ER diagram (given in figure below), explain the following terms briefly: *attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, participation constraint, ISA relationship:*



3 + 9 = 12

3. (a) Which of the following plays an important role in *representing* information about the real world in a database? Explain briefly.
(i) The data definition language
(ii) The data manipulation language
(iii) The buffer manager
(iv) The data model.

(b) Explain the difference between logical and physical data independence.

(c) Draw an ER diagram and explain entity, attribute, relationship set and weak entity set for the system given as follows:
An organization has a number of employees where each employee is identified by pan number, name and salary. Each employee may have one or many dependent(s) identified by dependent name and age. These dependents become beneficiary through policies purchased by Employees. Each of the policies purchased by employee(s) is identified by policyid and cost.

4 + 3 + 5 = 12

Group – C

4. Given relational schema:
Sailors (sid, sname, rating, age)
Reserves (sid, bid, date)
Boats (bid, bname, color)
1) Find names of sailors who've reserved boat #103
2) Find names of sailors who've reserved a red boat
3) Find sailors who've reserved a red or a green boat
4) Find sailors who've reserved a red and a green boat
5) Find the names of sailors who've reserved all boats.

Write expressions and SQL query for the following statements using Relational Algebra and SQL respectively.

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

5. (a) Give a set of FDs for the relation schema *R(A,B,C,D)* with primary key *AB* under which *R* is in 1NF but not in 2NF.

(b) Consider the relation shown in the following figure:

X	Y	Z
x_1	y_1	z_1
x_1	y_1	z_2
x_2	y_1	z_1
x_2	y_1	z_3

1. List all the functional dependencies that this relation instance satisfies.
2. Assume that the value of attribute Z of the last record in the relation is changed from $z3$ to $z2$. Now list all the functional dependencies that this relation instance satisfies.

(c) Suppose that we have the following four tuples in a legal instance of a relational schema R with three attributes ABC (listed in order): (1,1,1), (2,1,0), (3,3,2) and (4,3,2).
1. Which of the following dependencies that can you infer does *not* hold over the schema *R*?
(a) $A \rightarrow B$, (b) $BC \rightarrow A$, (c) $B \rightarrow C$
2. Can you identify any dependencies that hold over *S*?

(4 × 3) = 12

Group – D

6. Based on the following schema answer the queries given below.
Student(st_num, st_name, major, grade, age)
Class(cname, meet_ at_time, room, fac_id)
Enrolled(st_num, cname)
Faculty(fac_id, fname, deptid)
   (a) Find the names of all grade 10's who are enrolled in a class taught by "John Smith".
   (b) Find the names of all classes that either meet in room 5NE or have five or more students enrolled
   (c) Find the names of all students who are enrolled in two classes that meet at the same time.
   (d) Define a view part_time_students(st_num, st_name, major, grade, age) where a student is considered part-time if he or she takes less than 5 courses.

(3 × 4) = 12

7. (a) Define entity integrity and referential integrity. How does SQL allow specification of these?

   (b) Discuss the strengths and weaknesses of the trigger mechanism. Contrast triggers with other integrity constraints supported by SQL.

   (c) Explain the term stored procedure, and give examples why stored procedures are useful.

(4 × 3) = 12

Group – E

8. In the schedule given below, the label Ri(X) indicates a read of element X by transaction Ti, and Wi(X) indicates a write of element X by transaction Ti.
   (a) Draw the precedence graph for following schedule.
   R2(A) R1(C) R2(B) W2(B) R3(B) R1(A) R3(C) W3(C) W1(A)
   (b) Is the above schedule conflict-serializable? If so, what order of the three transactions defines a conflict-equivalent serial schedule?
   (c) What is a two-phase locking protocol? How does it guarantee serializability?

3 + 3 + 6 = 12

9. (a) What is indexed sequential file organization? What are the applications of this organization?

   (b) Describe B+ tree index files.

8 + 4 = 12

Department & Section	Submission link:
CSE	https://classroom.google.com/c/Mjc2ODgzMjk3NjI5/a/Mjc3MTE1MDg1ODY5/details