

Time: 3 Hours

**DECEMBER 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. An instance is

- (A) a set of relationships                      (B) a set of attributes  
(C) a set of entities                              (D) a database state

b. The highest level in the hierarchy of data organization is called

- (A) data bank                                      (B) data base  
(C) data file                                        (D) data record

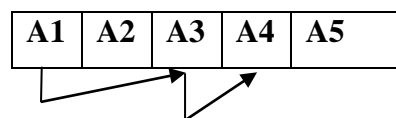
c. In a conceptual model for a university, what type of relationship exists between Grade and Student entities?

- (A) 1:1    (B) 1:M  
(C) M:N    (D) Ternary

d. The relational database environment has all of the following components except

- (A) users    (B) separate files  
(C) database                                        (D) query languages

e. What is the highest normal form level satisfied by the following table design?



- (A) 1NF    (B) 2NF  
(C) 3NF    (D) 4NF

- f. The \_\_\_\_\_ rule specifies that an entity can be a member of only one subtype at a time.
- (A) removal (B) exclusion  
(C) disjoint (D) inclusion
- g. An attribute or attributes that uniquely identify each row in a relation is called a(n)
- (A) field pointer (B) column  
(C) primary key (D) foreign key
- h. Duplication of data in files may cause
- (A) data integrity problems  
(B) data items with the same names used for different purposes  
(C) data items with different names in different files  
(D) both (A) and (C)

- i. In the following diagram, which of the answers below is true?

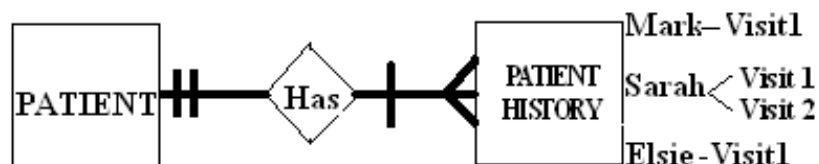


Fig. 1

- (A) Each patient has one or more patient histories  
(B) Each patient has one and only one visit  
(C) Each patient history belongs to one and only one patient  
(D) Both (A) and (B)
- j. A collection of operations that performs a single logic function is called
- (A) Schedule (B) Transaction  
(C) DBA (D) none of these

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

- Q.2 a. Give relative advantages of DBMS over Traditional file system. Classify DBMS and give examples of each. (6)
- b. Draw an entity relationship diagram of an airlines reservation system. Conceptualise a schema for it. (6)

- c. Differentiate between centralized and the client server based architectures used for DBMS. (4)
- Q.3** a. Consider the following collection of relation schemes  
 professor (profname, deptname)  
 department(deptname, building)  
 committee(commname, profname)  
 Write the following queries using relational algebra:
- (i) Find all the professors who are in any one of the committees that Professor Smith is in.  
 (ii) Find all the professors who are in at least all those committees that Professor Smith is in.  
 (iii) Find all the professors who are in exactly (i.e., no more and no less) all those committees that Professor Smith is in.  
 (iv) Find all the professors who have offices in at least all those buildings that Professor Smith has offices in. (8)
- b. Give a short note on relational data model. Also explain relational data model constraints. (6)
- c. How to find second maximum value from a table? (2)
- Q.4** a. For the following relational algebra, write their corresponding SQL statements:  
 (i)  $\Pi_{B.age, B.rank}(\sigma_{A.enum > B.enum}(\rho_A(employee) \times \rho_B(employee)))$   
 (ii)  $\Pi_{salary}(\sigma_{rank=manager}(employee)) - \pi_{employee.salary}(\sigma_{employee.salary < E.salary}(\sigma_{rank=manager}(employee) \times \sigma_{rank=manager}(\rho_E(employee))))$  (6)
- b. What is statically embedded SQL? How is it different to dynamically embedded SQL? What are the applications of embedded SQL? (6)
- c. What is view? What are the problems associated with an update operation of RDBMS if it is to be performed using views? (4)
- Q.5** a. Describe 4NF with the help of an example. Would you prefer BCNF over 4NF? Justify your answer. (6)
- b. "Practically, one must decompose the tables only till 3NF as it is loss less, dependency preserving decomposition." Comment on the above statement. Give example in support of your answer. How is 3NF different from BCNF? (6)
- c. Define the term Denormalization with a suitable example. (4)
- Q.6** a. How is single level indexing different from multilevel indexing? Explain the merits and demerits of multilevel indexes using B and B<sup>+</sup> trees. (6)
- b. Give a short note on data storage on disk. Explain its strategies and differentiate between them. (6)

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- c. Give a schematic diagram to explain the concept of hashing. (4)
- Q.7** a. What are the basic steps which DBMS might follow for query optimization? Describe with the help of an example. (6)
- b. Write note on cost-based query optimization. (5)
- c. When can a SELECT operation be executed with a conjunctive condition? List the different methods to implement the operation (5)
- Q.8** a. Explain the concept of multiversion concurrency control techniques. (6)
- b. What is a timestamp? How does the system generate timestamps? Discuss the timestamp ordering protocol for concurrency control. (8)
- c. What do you mean by 'Atomicity of Transaction'? (2)
- Q.9** a. Explain the recovery mechanisms used for transaction processing in a database management system. (8)
- b. Give short notes on:  
(i) Multimedia Databases (ii) Shadow Paging (6)
- c. Give a brief overview of ARIES Recovery Algorithm (2)