BACHELOR OF COMPUTER Sc. ENGG. EXAMINATION, 2009

(3rd Year, 1st Semester)

DATABASE MANAGEMENT SYSTEMS

Time : Three hours Full Marks : 100

Answer any ***five*** questions.

1. a) Draw the ER/EER diagram for the system given below :

In an institute various research projects are carried out. A project is either internally funded on externally funded one. There are various funding authorities to support the projects. A project is funded by one authority. Number of personnels are involved in a project. They may be faculty/student and a student may be UG/PG/PhD student. A project is coordinated by one or more faculty. A person may be involved in multiple projects. Each project owns a set of instruments. As the outcome, research papers are published in connection with the projects and the papers are authored by one on more (may not be all) persons involved in the project.

The system will have to maintain the details of the projects, fund provided, details of funding authorities, persons involved, research publication and instrument details. 10

b) In database design, how does EER/ER diagram help to identify the foreign keys. 6

c) How does the multivalued attribute influence the database design ? 4

2. a) What is functional dependency ? Explain the meaning of referential integrity ? 5

b) 'Armstrong's Axious are sound and complete' — explain. 2½

c) Given a set of FDs that holds on a relation. How can you find out the candidate key ? 2½

d) Consider the following relations :

STUDENT (ROLL , NAME), SUBJECT (SCODE , SNAME), RESULT (ROLL , SCODE , MARKS).

i) Write down the relational calculus expression to find out the name of the students who have scored less than 50 in atleast one subject.

ii) Write down the relational calculus expression to find out the ROLL of the students who have scored 80 or more in the subject named DBMS.

iii) Write down the relational algebra expression to find out Name and Total Marks (sum of marks in all subjects) for all the students.

iv) Write down the relational algebra expression to find out subject codes in which all the students have scored more than 60. 10

d) Two relations R1 and R2 are to be joined. R1 is very small. Joining attribute is PK of R1 and FK of R2. A secondary index on joining attribute is available for R2. Suggest an algorithm for joining so that block access is optimized. 6

6. a) What is a Transaction ? Discuss the ACID properties and various states. 7

b) What is cascading rollback ? Discuss a time stamp based protocol which can avoid cascading rollback. Also explain, whether it gives rise to deadlock or not. 10

c) Discuss the phases in 2-phase locking protocol. 3

7. a) What is a conflict serializable schedule ? 5

b) What is the utility of checkpoint ? What happens when checkpoint is executed ? Discuss, checkpoint based recovery mechanism for a concurrent environment. 10

c) Discuss the security features of DBMS. 5

8. Write short notes on the following :

i) NO_DATA_FOUND and TOO_MANY_ROWS exceptions in PL/SQL. 5

ii) Database triggers. 5

iii) Outer join. 4

iv) Functional units of DBMS. 6

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3. a) Why do we used normalization ? 5

b) Consider a data structure to store the following information :

Product-code, Product-name, Product-rate, sales-tax-rate, Product-Mgr-Name, (u P-M-Name), P_M_address, P_M_Phone, P_M_mail, and also for each component used in the product, information like comp-code, comp-name, comp-price and comp-qty-reqd.

Consider, Product-code is unique. Further assume, the following FDs :

Product-code $\rightarrow$ P_M_Name

P_M_Name $\rightarrow$ P_M_address, P_M_Phone, P-M-mail

Comp_code $\rightarrow$ Comp_name, Comp_price

Product-Code, Comp_code $\rightarrow$ Comp_qty_reqd.

Normalize upto 3NF with brief reasoning. Indicate the primary and foreign keys. 10

c) What is the drawback of BCNF ? 2½

d) What is spurious tuple ? 2½

4. a) Consider the following tables :

ITEM (ICODE , INAME, PRICE)

ORDER (ORD – NO, ICODE , QTY)

Write down the SQL statements for the following :

(i) Find out the order number and total value (sum of QTY × PRICE of the ordered items) for all orders

with total value more than 50,000 in the descending order of total value. 4

(ii) From ITEM table delete the items which have not been ordered at all. 3

(iii) In all orders, decrease the QTY of the item whose name is ‘OIL’ by 50%. 3

(iv) For each item, show ICODE and total quantity ordered. 3

b) Consider the following tables :

STUDENT (ROLL , NAME TOTAL–SCORE, STATUS)

RESULT (ROLL, SCODE , MARKS).

RESULT contains marks of all the students in all subjects. Write a PL/SQL block to update TOTAL_SCORE and STATUS in STUDENT table. TOTAL_SCORE will be the sum of marks in all the subjects. STATUS is set to ‘p’ or ‘F’. If a student scores 50 or more in all the subjects then STATUS is set to ‘P’ else it is ‘F’. 7

5. a) Assume, binary search is applicable on a database for executing a particular query. Still one may go for indexing. Why ? 5

b) Discuss the principles of multilevel indexing. 4

c) When will you use merge join and hash join ? Also discuss about the number of block access required in each case. 5