S'16 : 2 FN : CP 415 (1457)

DATABASE MANAGEMENT SYSTEMS

Time : *Three hours*

Maximum Marks : *100*

Answer FIVE *questions, taking* ANY TWO *from* **Group A,** ANY TWO *from* **Group B** and ALL *from* **Group C.**

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answer may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*) What are the problems with traditional file processing system ? How are these removed in a database system ? Explain. 10

   (*b*) Describe the three-level architecture of DBMS. Also, explain its importance in a database environment. 5

   (*c*) What is DBA ? What are major responsibilities of DBA ? 5

2. (*a*) Explain the ACID properties of database transactions. 4

   (*b*) The Registrar's office in a university maintains data

about the following entities : (*i*) Courses, including number, title, credits, syllabus and prerequisites; (*ii*) course offerings, including course number, year, trimester, section number, instructor(s), timings and class-room; (*iii*) students, including student-id, name and program; and (*iv*) instructors, including identification number, name, department and title. Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an ER diagram for the Registrar's office. Document all assumptions that you make about mapping constraints. 10

(*c*) Give an overview of hierarchical data model, explaining the concept of hierarchical schema and the limitations of pure hierarchies. 6

3. (*a*) Briefly explain how the physical failure of database can be avoided by using RAID technology. 4

(*b*) Consider the following databases :

PAINTER (**Ptr_Num**, Ptr_Lastname, Ptr_firstname, Ptr_initial, Ptr_areacode, Ptr_phone)

GALLERY (**Gal_num**, Gal_owner, Gal_areacode, Gal_phone, Gal_rate)

PAINTING (**Pntg_num**, Pntg_title, Pntg_price, Ptr_num, Gal_num)

Write the relational algebraic expressions for the following operations : 5×2

(*i*) Find all painters who have paintings in Gal_num = 4.

(*ii*) Find all paintings of Gallery whose rate is > 1000.

(*iii*) Find the gallery in which painter 'Ramesh' has displayed his paintings.

(*iv*) Find the number of paintings displayed in Gallery owned by 'Shyam'.

(*v*) Find all the names of painters whose painting price is greater than Rs. 50,000.

(*c*) Explain, with an example, *any three* fundamental operators in relational algebra. 3 × 2

4. (*a*) Define functional dependency. Give examples of functional dependency. How can functional dependencies be used to identify the primary key ? 5

(*b*) Define III Normal Form. Illustrate how it rectifies anomalies in I and II Normal Forms with an example. 10

(*c*) Explain how query processing cost is estimated. 5

Group B

5. (*a*) What are aggregate functions ? Explain the aggregate function in relational model with suitable example. 5

(*b*) Using the following relations : 5 × 2

Project (Project#, Emp#, Project-name)
Assigned-to (Project#, Emp#)
Employee (Emp#, Name)

Give expressions in SQL for the following queries :

(*a*) Get Emp# of employees working on project numbered COMP_353 and COMP_354.

(*b*) Get details of employees working on all database project.

(c) Get employee numbers of employees who work on all those projects that employee 107 works on.

(d) Get employee numbers of employees who work on at least one project that employee 107 works on.

(e) Get employee names of employees who do not work on project COMP_453.

(c) Give different joins available in relational model and explain them with an example. 5

6. (a) What are NULL values and how is it handled in ORACLE ? Explain three part logic : True, false and NULL in ORACLE with an example. 5

(b) What are different types of indices supported by Oracle ? Discuss in detail about their features and advantages. 8

(c) Elaborate on concurrency control and recovery mechanisms in Oracle. 7

7. (a) What are the main objectives in designing a secure database application ? 4

(b) Define the terms 'multilevel table' and 'poly-instantiation'. 8

(c) What is a database security ? Differentiate between authentication, authorization and access control. 8

8. (a) What are different phases involved in the life-cycle of development of a database application. Explain various activities involved in each phase in detail. 10

(b) What are the various (at least two) constraints used in Oracle ? Give examples of each. 4

(*c*) Give an overview of Office Automation System and list the benefits of such a system in an organisation. 6

Group C

9. Answer the following : 10×2

(*i*) Consider the following SQL statement :

```
SELECT qty FROM sales
WHERE rate IN (300, 800)
```

Which one of the following operators can be used to substitute the 'IN' operator ?

(*a*) AND (*b*) BETWEEN...AND

(*c*) LIKE (*d*) OR

(*ii*) ——— is an important phase in designing a successful database application.

(*a*) E-R modeling

(*b*) System modeling

(*c*) Conceptual modeling

(*d*) None of the three above.

(*iii*) Attributes are particular properties that describes

(*a*) fields. (*b*) entity.

(*c*) records. (*d*) None of the three above.

(*iv*) ——— specifies a search condition for a group or an aggregate.

(*a*) GROUP BY clause. (*b*) HAVING clause.

(*c*) FROM clause. (*d*) WHERE clause.

(*v*) In BCNF, a relation schema R is in BCNF, if whenever a non-trivial functional dependency $X \rightarrow A$ hold in R, then X is

(*a*) super key of R.

(*b*) primary and secondary key of R.

(*c*) binary key of R.

(*d*) foreign key of R.

(*vi*) Which one of the following is not a responsibility of Data Base Administrator ?

(*a*) Database design

(*b*) Backing up the database

(*c*) Transaction updation

(*d*) Performance monitoring

(*vii*) Which one of the following cost is the most important component to be considered during the cost-based query optimization ?

(*a*) Memory usage cost

(*b*) Secondary storage access cost

(*c*) Communication cost

(*d*) All the three above.

(*viii*) Given the relations :

employee (name, salary, deptno) and
department (deptno, deptname, address)

Which one of the following queries cannot be expressed using the basic relational algebra operations $(\sigma, \pi, x, \infty, \cup, \cap)$?

(*a*) Department address of every employee.

(*b*) Employees whose name is the same as their department name.

(*c*) The sum of all employee salaries.

(*d*) All employees of a given department.

(*ix*) What do you mean by GROUP BY clause ? How is it useful ?

(*x*) What is meant by database tuning ?