2017

(October)

COMPUTER SCIENCE

(Elective/Honours)

(Database Management System)

(CS–301 T)

Marks : 56

Time : 2½ hours

The figures in the margin indicate full marks for the questions

Answer **one** question from each Unit

UNIT—I

1. *(a)* What do you understand by actors on the scene and workers behind the scene? 3

   (b) What are the responsibilities of the DBA and the database designers? 3+3=6

   (c) Discuss the main characteristics of the database approach. How does it differ from traditional file systems? 4+2=6

2. *(a)* Explain three-schema architecture and data independence. 3+2=5

(b) What is a participation role? When is it necessary to use role names in the description of relationship types? 2+3=5

(c) What is the difference between a database schema and a database state? 5

UNIT—II

3. *(a)* Consider a disk with the following characteristics :

Block size $B = 512$ bytes

Interblock gap size $G = 128$ bytes

Number of blocks per track = 20

Number of tracks per surface = 400

A disk pack consists of 15 double-sided disks.

(i) What is the total capacity of a track and what is its useful capacity? 2

(ii) How many cylinders are there? 1

(iii) What is the total capacity and the useful capacity of a cylinder? 1

(iv) What is the total capacity and the useful capacity of a disk pack? 1

(Continued)

(b) Compare and contrast a Primary Index to a Clustering Index. Illustrate it with a suitable example along with an annotated diagram. 3

4. *(a)* Explain the term 'blocking factor'. 2

(b) Suppose that a disk unit has the following parameters :

Seek time $s = 20$ m sec; Rotational delay r.d.=10 m sec; Block transfer time b.t.t.=1 m sec; Block size $B = 2400$ bytes; Interblock gap size $G = 600$ bytes

An EMPLOYEE file has the following fields :

SSN, 9 bytes; LASTNAME, 20 bytes; FIRSTNAME, 20 bytes; MIDDLE INIT, 1 byte; BIRTHDATE, 10 bytes; ADDRESS, 35 bytes; PHONE, 12 bytes; SUPERVISORSSN, 9 bytes; DEPARTMENT, 4 bytes; JOBCODE, 4 bytes; deletion marker, 1 byte

The EMPLOYEE file has $r = 30000$ STUDENT records, fixed-length format, and unspanned blocking.

(Turn Over)

Write down appropriate formulas and calculate the following values for the above EMPLOYEE file : 2×3=6

(i) The record size R (including the deletion marker), the blocking factor b.f.r., and the number of disk blocks b.

(ii) The wasted space in each disk block because of the unspanned organization.

(iii) The transfer rate t.r. and the bulk transfer rate b.t.r. for this disk.

UNIT—III

5. (a) Explain the following in terms of relational model concept with example : 2×3=6

(i) Domains

(ii) Attributes

(iii) Tuples

(b) Discuss equi-join operation with an example. 3

(Continued)

(c) Assuming the tables Employee (SSN, FName, LName, Salary, DeptId, Age, Address, Pincode) and Department (DeptNo, DName, Dlocation), write SQL for the following : 3×2=6

(i) List out the tuples of all the employees whose salary is greater than 20000.

(ii) List out the department-details for all the departments, where employee above the age of 45 is working.

6. (a) What are the SELECT and PROJECT algebra operations from set theory? Explain with examples. 3+3=6

(b) Explain GROUP BY clause with proper example. 3

(c) With reference to the above tables in Q. No. **5.**(c)—

(i) display the tuples of employees having age above 35 for each department using relational algebra;

(ii) display the FName and Salary of employees having salary > 20000 using relational algebra. 3+3=6

(Turn Over)

UNIT—IV

7. (a) Describe 3NF normalization with an example. 3

(b) Define functional dependency. What do you understand by closure of an F, where F is a set of all possible dependencies? 2+1=3

8. (a) Explain multivalued dependency. Explain 4NF with an example. 2+2=4

(b) What do you mean by a minimal set of functional dependency? 2

UNIT—V

9. (a) Discuss the possible states, a transaction can assume with a suitable diagram. 6

(b) What is a schedule? When are two operations in a schedule said to be conflict? What is a complete schedule? 2+2+2=6

(Continued)

10. (a) What is a binary lock? How is a/an shared/exclusive lock different from it? Explain the operations read_lock(X) and write_lock(X) and unlock(X). 1+1+3=5

(b) Explain Strict Timestamp Ordering Protocol. 4

(c) Explain briefly threats to a database. 3

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