

2011

This question paper contains 4 printed pages.

6623

Your Roll No.

B.Sc. (Hons.) Computer Science / V Sem. B

Paper – CS 501 : FILE STRUCTURES AND DATABASE SYSTEMS

(Admissions of 2001 and onwards)

Time : 3 hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt all questions.

Parts of a question must be attempted together.

- 1)
- a) Explain data independence. Why is data independence a desired goal for database approach? (3 +2)
 - b) Which type of user would perform the following functions for a billing system in a large company: (2)
 - (i) Responding to call from customer regarding the current balance due amount to them.
 - (ii) Write a program to generate monthly bills.
 - (iii) Make changes in physical schema to improve performance of the queries on the database.
 - (iv) Develop schema for a new billing system
 - c) List the database system utilities provided by most DBMSs and explain these utilities briefly. (4)

- 2)
- a) Draw the ER diagram specifying clearly Keys, cardinality and participation constraints for the following problem.

M-Series Music Company has decided to store information about musicians who perform on its album in a database.

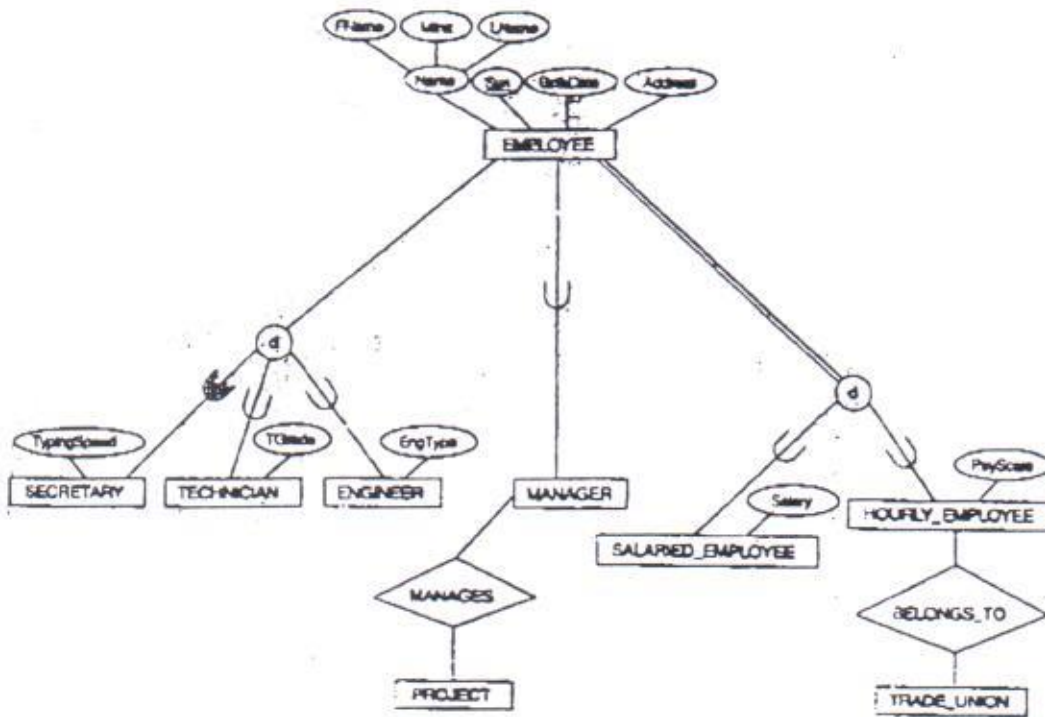
- Each musician has (SSN, NAME, ADDRESS and PHONE NUMBER). No address has more than one phone. Each instrument used in songs recorded at the company has a UNIQUE ID NUMBER (UID), NAME (eg GUITAR, FLUTE etc.).
- Each album recorded has a UID, TITLE and COPYRIGHT DATE. Each song recorded has a TITLE and an AUTHOR.
- Each musician may play several instruments and an instrument may be played by several musicians.
- Each album has a number of songs but no same song can appear in more than one album.
- Each song is performed by one or more musicians and a musician may perform a number of songs.
- Each album has exactly one musician as its producer. However, a musician may produce several albums.

(10)

Turn over

b) Map the following specialization into relations.

(5)



3)

- a) Differentiate between the followings giving one example each:
 - i) Relation and views
 - ii) Entity and Referential Integrity Constraints

(2+2)

b) Find candidate keys for the following relation:

(2)

| Field1 | Field2 | Field3 |
|--------|--------|--------|
| A | 10 | e |
| B | 20 | f |
| C | 30 | g |
| D | 10 | h |
| A | 15 | h |

c) Consider the following schema STUDENT_ENROLLMENT

- STUDENT(SSN, Name, Course#, Bdate)
- COURSE(Course#, Coursename, Deptname)
- ENROLL(SSN, Course#, Semester, Grade)
- BOOK_ADAPTION(Course#, Semester, Book_ISBN)
- TEXT(Book_ISBN, Book_title, Publisher, Author)

Write down following queries in Relational Algebra:

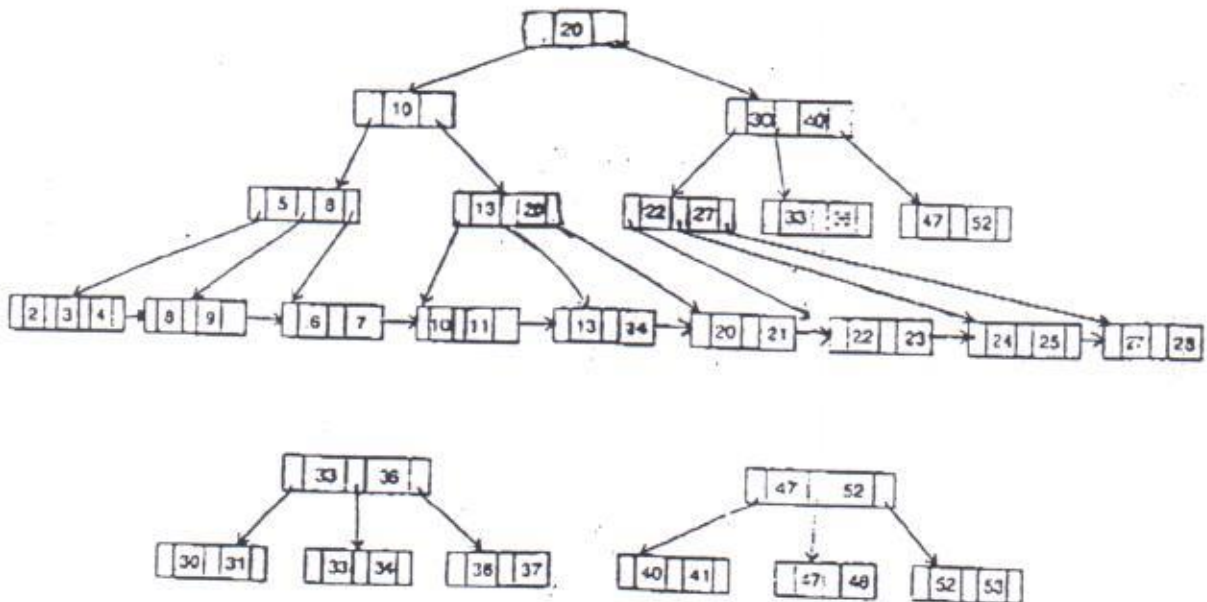
- i) Retrieve a list of text books with course#, Book_ISBN, Book_title for courses offered by 'Computer Sc' department.
- ii) List course name in which more than 2 books are used.
- iii) List any department that has all its adapted books from the 'BPR' publisher

(2x3)

4) Use schema STUDENT_ENROLLMENT (Q. No. 3(c)) to answer following queries in SQL
 a) Create given tables with all possible constraints. Choose appropriate datatypes for attributes. (3)

- b)
- i) Insert a new course with code CS405, name 'Software Engg' offered by deptt. of Computer Sc.
 - ii) Delete course in which no student is enrolled.
 - iii) Modify book_title to 'Database Systems' of the book with BOOK_ISBN 'B101'
 - iv) Display Course names in which at least 5 students have got Grade 'B'.
 - v) Retrieve student names studying in department 'Computer Sc.'
 - vi) Retrieve course name in which minimum students are enrolled (1+1+1+2+1+2)

5) a) Given the tree structure as B+ tree (at the end of question paper). List all violations in the given tree, assuming the tree is of order four i.e. 4 keys and 5 pointers. (4)



b) Consider a file that contains records with the following search key values and is using extendable hashing:

- 2, 3, 5, 7, 11, 19, 23, 29, 31

(4)

Show the extendable hash structure for this file if the hash function is $h(x) = x \text{ mod } 8$ and buckets can hold three records,

- c) When is it preferable to use a dense index rather than a sparse index? Explain your answer. (1)
- d) Let us assume that a disk block hold either three records, or ten key-pointer pairs. As a function of n , the number of records, how many blocks do we need to hold a data file and
- i) A dense index ? ii) A sparse index ? (3)
- 6)
- a) What are Armstrong's inference rules and why are they important? (2+1)
- b) Given a relational scheme $R(X,Y,Z,U,W)$ with FDs $F=\{X \rightarrow YZ, U \rightarrow X, YZ \rightarrow U\}$
- i) Find candidate keys of R .
- ii) Compute minimal cover of F .
- iii) What normal form is R in? Normalize it further till it cannot be decomposed, stating reasons for decomposition. (2+2+4)
- c) Explain insertion and modification anomalies with examples. (3)