(a) Find the result for the following: X/Y<sub>1</sub>, X/Y<sub>2</sub> and X/Y<sub>3</sub>, where X, Y<sub>1</sub>, Y<sub>2</sub> and Y<sub>3</sub> are relations and '/' indicates division operation performed between two relations.

X=

Sno.	Pno.		Pno
N <sub>1</sub>	P <sub>1</sub>	Y <sub>1=</sub>	P <sub>2</sub>
N <sub>1</sub>	P <sub>2</sub>		
N <sub>1</sub>	P <sub>3</sub>		Pno
N <sub>1</sub>	P <sub>4</sub>	Y <sub>2</sub> =	P <sub>2</sub>
N <sub>2</sub>	P <sub>1</sub>		P <sub>4</sub>
N <sub>2</sub>	P <sub>2</sub>		Pno
$N_3$	P <sub>2</sub>	Y <sub>3</sub> =	P <sub>1</sub>
N <sub>4</sub>	P <sub>2</sub>		P <sub>2</sub>
N <sub>4</sub>	P <sub>4</sub>		P <sub>4</sub>

(b) Consider a Bank database taking care of accounts (saving, current, fixed deposit, flexible etc.) and loans (house, auto, business). Supppose it is necessary to keep track of each account transaction (deposit, withdrwal, checks, ATMs etc.). Draw a graphical object database schema and object database language for the above database. State any assumption you make about additional requirements.

(c) Discuss Fragmentation in distributed database with suitable example.

(a) Consider the following decompositions for the relation schema R.
4+3
R={A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies
$F = \{ \{A, B\} - > \{C\}, \{A\} - > \{D,E\}, \{B\} - > \{F\}, \{F\} - > \{G,H\}, \{D\} - > \{I,J\} \} $
(i) Determine whether each decomposition has the dependency
preservation property and the lossless join property with respect to F.
(ii) Also determine which normal form each relation in the decomposition
is in.
(b) Illustrate with an simple example how an efficient cost function method
can be devolpoed for the JOIN operation. 7
(c) Discusss some important advantages and disdvantages of NoSQL
database. 6

the following fields: Name(25 bytes), Ssn(8 bytes), Address (40 bytes), PHONE (9 bytes), Birth date (8 bytes), Sex(1 byte), Major dept code(5 bytes), Minor dept code(5 bytes), Class code(3 bytes, integer), and Degree program (3 bytes). An additional byte is used as a deletion marker. The file is stored on disk whose parameters are given in the following: block size B=1024 byte, inter block gap size G=64 bytes, number of block per track=18, number of tracks per surface=420. A disk pack consists of 20 double-sided disks. 10 (i) Calculate the record size R in bytes. (ii) Calculate the blocking factor bfr and the number of file blocks b, assuming an unspanned organization.

3. (a) A file r=36,000 STUDENT records of fixed length. Each record has

- (iii)Calculate the average time it takes to find a record by doing a linear search on the file if (i) the file blocks are stored contiguously, and double buffering is used. (ii) the file blocks are not stored contiguously.(iv)Assume the file is ordered by Ssn, by doing a binary search calculate the
- (iv)Assume the file is ordered by Ssn, by doing a binary search calculate the time it takes to search for are record given its Ssn values.
- (b) How BASE property counters the ACID property. 10

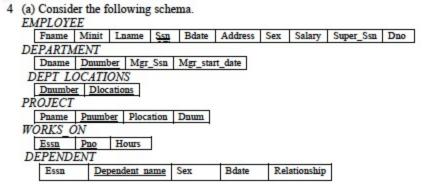


Figure 1

Suppose that the *EMPLOYEE* file of an organization has  $r_E$ =10,000 records stored in  $b_E$ =2000 disk blocks with blocking factor  $bfr_E$ =5 records/block and the various access paths (i) A clustering index on salary with levels  $x_{salary}$ =3 and average selection cardinality  $S_{salary}$ =20. (ii) A secondary index on the key attribute  $x_{Son}$ =4 (Ssn=1). (iii) A secondary index on Sex with  $x_{salary}$ =1 and average selection cardinality  $S_{sex}$ =5000. Illustrate how an efficient cost function method can be developed for the following SQL query  $\sigma_{Dno}$ =5 AND SALARY>3000 AND Sex=F(EMPLOYEE).

(b) Draw the initial query tree for each of these queries and then show how the query tree is optimized by query optimization algorithm.

(i) SELECT Fname, Lname, Address FROM EMPLOYEE, DEPARTMENT
WHERE Dname='Research' AND Dnumber=Dno. 5.5

(ii) SELECT E.Fname, E.Lname, S.Fname, E.Lname FROM EMPLOYEE AS E, EMPLOYEE AS S WHERE E.Super\_ssn=S.Ssn. 5.5

(c) Discuss Multivalued dependency with an example

4

(b) What are the trade offs and benefits of using object oriented database management system over relational database management systems.

(c) Discuss in Transaction Processing Monitor architecture in detail.