NOC24-CS75
Data Base Management System

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Week - 5

Question - 1

Which of the following can be the solution(s) for Password Leakage Problem in Database Servers?

a) Two-factor authentication (password plus one-time password sent by SMS).

b) Storing encrypted passwords in database and in scripts.

c) Using the same password across different sites.

d) Single-factor authentication using usernames and passwords.

Solution - 1

Solution: (a), (b)

Question - 2

In a file structure of Variable-Length Records, which of the following does a slotted page header contain?

a) block pointer

b) number of record entries

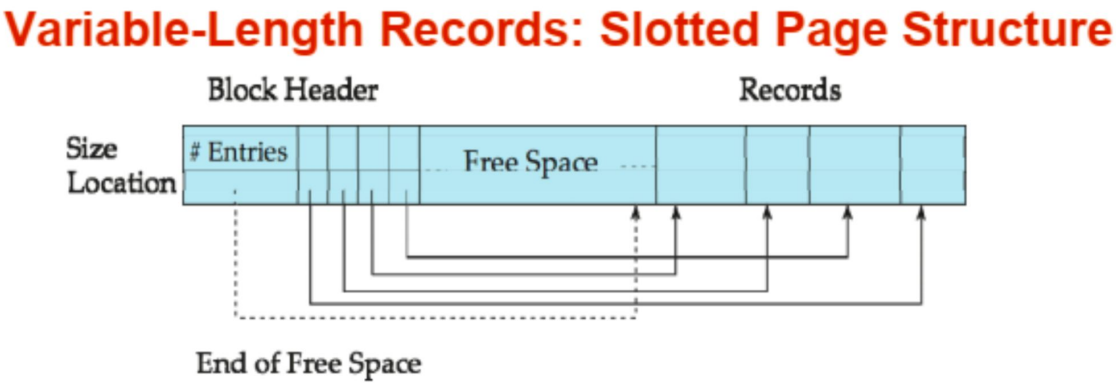
c) end of free space in the block

d) size of the next record

Solution - 2

Answer: (b), (c)

Explanation: Refer to slide 12 module 25.



Question - 3

A file organization is sequential and unspanned (one block can store only whole records). The disk block size is 512 bytes. Each record of the file is 32 bytes long and the block pointer size is 12 bytes. How many records can be stored in one block?

a) 17

b) 16

c) 15

d) 14

Solution - 3

Solution: (c)

The file organization is unspanned. So one block can store *n* whole records and one block pointer.

One record size(V) = 32 bytes

Disk block size = 512 bytes

Disk block pointer (p) = 12 bytes

Actual Storage size of one block = (512-12) =500 bytes

n = floor(500/32) = 15

So, a maximum of 15 records can be stored in a block.

Question - 4

Suppose that the record of a book in a library is 300 bytes long. The details of the disk storage is as follows. The disk unit rotates at 7200 rpm (revolutions per minute). The data transfer rate of the disk is 75000 bytes per second whereas seek time is 20 milliseconds. One block contains 5 such records of the book. If a student asks to know the details of a given book, how much time will be required to know that?

a) Approx. 441 milliseconds

b) Approx. 44 milliseconds

c) Approx. 24 milliseconds

d) Approx. 4 milliseconds

Solution - 4

Solution: (b)

Explanation:

Seek time = 20 milliseconds = 20/1000 sec = 0.02 sec

Average Rotational delay = 1/2r minutes = 60/ (2*7200) sec = 1/240 sec = 0.00416

Block transfer time = 5*300/data transfer per second = 1500/75000 sec = 0.02

So, Access time = seek time + Rotational delay + Block transfer time

= 0.02 + 0.00416 + 0.02 =0.04416 sec = 44 milliseconds

Question - 5

What is the availability of a Database Management System having the following reliability parameters?

Mean Time Between Failure (MTBF) = 36 days

Mean Time to Repair (MTTR) = 18 hours

a) 20.01%

b) 64.25%

c) 97.95%

d) 99.02%

Solution - 5

Answer: (c)

Explanation: Mean time between failures is not the average time that the system is working and then fail. It is the average time between failures.

Mean time between failures (MTBF) = total uptime / number of failures.

Mean time to repair is the average time taken to repair the system after failure.

Mean time to repair (MTTR) = total down time/number of failures.

Availability = Total uptime / (total uptime + total downtime)

= MTBF/(MTBF+MTTR)*100 = 36*24/(36*24 + 18) *100 = 97.95 %

Question - 6

Suppose that a disk drive has 200 tracks, numbered 0 to 199. The queue of pending requests in FIFO order is: 75, 142, 93, 177, 48, 150, 102, 171, 136.

The read-write head initially is on track 45. What is the total distance that the disk head will move to satisfy all pending requests following first cum first serve(FCFS) scheduling algorithms?

a) 563

b) 613

c) 633

d) 823

Solution - 6

Answer: (b)

Explanation:

(75-45)+(142-75)+(142–93)+(177–93)+(177–48)+(150-48)+ (150 – 102) + (171 – 102) + (171 – 136)

= 30 + 67 + 49 + 84 + 129 + 102 + 48 + 69 +35

= 613 tracks

Question - 7

Suppose that a Database Management System uses the Most Recently Used (MRU) strategy as its buffer replacement policy. Further, suppose that the system allocates 4 free buffer blocks for execution of a query to be used as a buffer. Assume that a query requires to access the following disk blocks in that order to complete its execution:

9,5,1,2,5,3,5,4,2,3,5,3,2,1,2,5,1,9,5,1

Calculate the number of block replacements (when all blocks are full, a residing block is replaced with a required block) required to complete the query.

a) 7

b) 8

c) 9

d) 10

Solution - 7

Requirement Details	Buffer Blocks			
9 - not available, 9 will be placed to an empty block	9			
5 - not available, 5 will be placed to an empty block	9	5		
1 - not available, 1 will be placed to an empty block	9	5	1	
2 - not available, 2 will be placed to an empty block	9	5	1	2
5 - available	9	5	1	2
3 - not available, in MRU 5 is just used and will be replaced by 3	9	3	1	2
5 - not available, 3 will be replaced by 5	9	5	1	2
4 - not available, 5 will be replaced by 4	9	4	1	2
2 - available	9	4	1	2
3 - not available, 2 will be replaced by 3	9	4	1	3
5 - not available, 3 will be replaced by 5	9	4	1	5
3 - not available, 5 will be replaced by 3	9	4	1	3
2 - not available, 3 will be replaced by 2	9	4	1	2
1 - available	9	4	1	2
2 - available	9	4	1	2
5 - not available, 2 will be replaced by 5	9	4	1	5
1 - available	9	4	1	5
9 - available	9	4	1	5
5 - available	9	4	1	5
1 - available	9	4	1	5

Number of block replacement here is 8.

Question - 8

Consider the following statements:

1. Copy the required block from the disk to the main memory buffer.
2. The program calls the buffer manager for the required block.
3. Buffer manager returns address of the block residing in main memory to the program
4. Replace some other block, if the buffer blocks in main memory are not free.

Arrange them in order to resolve what happens, when a program identifies that a required block is not available in the main memory buffer.

Solution - 8

Solution: 2,4,1,3

Question - 9

Consider the following schema:

Member(Mid, Fname, Lname, Domain, Gender, Mobile no, DOI)

Journal_publication(DOI, J_name, J_type, No_of_publication, Mid)

with the following functional dependencies:

Mid → Fname, Lname, Domain, Gender, Mobile no

Mid → DOI

DOI → Mid

DOI→ J_name, J_type, No_of_publication

Which will be the refined optimal schema from the followings?

Question - 9

a) Member(Mid, Fname, Lname, Domain, Gender, Mobile_no, DOI)
Journal_publication(DOI, J_name, J_type, No_of_publication, Mid)
Jounal_list(DOI, Mid)

b) Member(Mid, Fname, Lname, Domain, Gender, Mobile_no)
Journal_publication(DOI, J_name, J_type, No_of_publication, Mid)

c) Member(Mid, Fname, Lname, Domain, Gender, Mobile_no, DOI)
Journal_publication(DOI, J_name, J_type, No_of_publication)
Jounal_list(DOI, Mid)

d) Member(Mid, Fname, Lname, Domain, Gender, Mobile_no)
Journal_publication(DOI, J_name, J_type, No_of_publication)

Solution - 9

Answer: b)

Explanation:

Option a) has redundancy. So, it is not optimal.

Option c) needs extra memory access. So it is not optimal.

Option d) can not preserve dependency. Hence, it never can meet the requirement.

Option b) can preserve all the dependencies and it is optimal.

Question - 10

Suppose you have a 128-gigabyte flash storage system with a 2048-byte page size. How big would the flash translation table be, assuming each page has a 32-bit address, and the table is stored as an array?

a) 256 megabytes

b) 32 megabytes

c) 64 bytes

d) 32 bytes

Solution - 10

Solution: (a)

Explanation:

Number of page = 128 gigabyte/2048 byte = 64 M

Each address requires 32 bits or 4 bytes.

Therefore, the array size would be 64 M * 4 bytes = 256 megabyte

Question - 11

Choose the `INCORRECT` statement from the following.

a) Data Dictionary stores the information about schema definition.

b) Data Dictionary stores the information about Integrity constraints on a relation.

c) Data Dictionary does not store user and accounting information of a database.

d) Data Dictionary stores the information about file organization.

Solution - 11

Answer: c)

Explanation:

According to the definition, Data Dictionary store metadata such as:-

- Information about relations which includes name of relations, their attributes, integrity constraints
- User and accounting information including passwords
- Statistical and descriptive Data
- Physical File organization information
- Information about Indices etc.

(Refer Lecture-25)
So the statement in option c) is INCORRECT.

Question - 12

The different Uniform Resources used to identify and locate Web resources in the Web are Uniform Resource Identifier(URI), Uniform Resource Locator (URL) and Uniform Resource Name(URN). Find the `INCORRECT` statement from the following regarding URI, URL and URN.

a) URI can either be a URN or URL or both.

b) URN identifies a Web resource by its name given in the namespace.

c) URL provides the functionality of pointer to locate a Web resource in the Web.

d) URL defines something's identity, while URN provides a location.

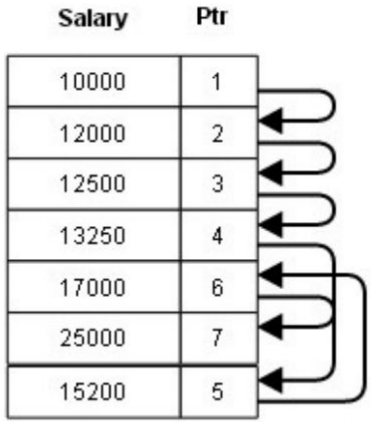
Solution - 12

Answer: d)

Explanation: According to the definition, URI can be classified as URL or URN, or both. URL is used to locate a Web resource in the web and URN provides a method to identify a Web resource by the name given in the namespace.

Question - 13

Consider a table which contains the salary of employees. A new salary of 15200 is inserted into this table after which the pointers are rearranged as shown in the figure. Which of the following file organizations is used to represent this?



a) Sequential File Organization.

b) Heap File Organization.

c) Multitable Clustering File Organization.

d) Hash File Organization.

Solution - 13

Answer: (a)

Explanation: According to the definition-

Sequential File Organization stores records in sequential order, based on the value of the search key of each record.

Heap File Organization stores records anywhere in the file where there is space.

Multitable Clustering File Organization stores records of several different relations in the same file.

Hash File Organization uses a hash function for each record and the result specifies in which block of the file the record should be placed.

Question - 14

If a disk system contains $1,600$ disk drives, and each has a $4,00,000$ hour MTBF (Mean time between failure), how often a drive failure will occur in that disk system?

a) 6400000 hours

b) 400000 hours

c) 400 hours

d) 250 hours

Solution - 14

Answer: (d)

Explanation:

MTBF (array) = MTBF (one disk) / Number of disks in array

So, answer is 400,000 / 1600 = 250 hr

Question - 15

Consider a disk pack with the following specifications: 16 double-sided platters, 256 tracks per surface, 512 sectors per track and 1024 bytes per sector. Which of the following is the correct capacity of disk (approximately)?

a) 512 MB

b) 2 GB

c) 4 GB

d) 8 GB

Solution - 15

Answer: c)

Explanation: Capacity of a track = sector size * number of sectors per track
= 512 * 1024 bytes = $2^9 * 2^{10} = 2^{19}$ **bytes**

Capacity of each surface = capacity of track * number of tracks per surface
= 2^{19} * 256 = $2^{19} * 2^8 = 2^{27}$ **bytes**

Capacity of the disk = capacity of one surface * number of platters * number of side per platter
= 2^{27} * 16 * 2 = 2^{32} **bytes = 4 Gigabytes**

Question - 16

If you want to design a secure database applications with large amounts of data and low update rate. Which of the following RAID level will you select?

a) RAID level 5

b) RAID level 3

c) RAID level 1

d) RAID level 0

Solution - 16

Answer: (a)

Explanation: Redundant array of independent disks (RAID) is a way of storing the data. Level 5 is preferred for applications with low update rate, and large amounts of data. Levels 1 and 5 offer adequate safety for most applications. Refer course material for more details.

Question - 17

In a `Cafe Shop`, several types of food items are there. A customer places his/her order. A serviceman can serve multiple orders but an order will be serviced by only one serviceman. A customer can place more than one order. Which of the following statement(s) is (are) true?

a) There will be minimum three entities in the E-R diagram.

b) There will be minimum four entities in the E-R diagram.

c) Minimum two relationships will be required in the E-R diagram to modeled the scenario.

d) Minimum three relationships will be required in the E-R diagram to modeled the scenario.

Solution - 17

Answer: b), c)
Explanation: If we draw the `ER diagram` for the above problem, there will be a minimum of `four` entities (`foodItem, customer, order`, and `serviceman`) and a minimum of `two` (one is a ternary relationship `'place_order'` between customer, foodItem and order, and other is a binary relationship `'serve'` between serviceman and order) relationships will be required.
So, options (b) and (c) are the correct options.

Question - 18

Consider there is a sequential file for the relation `Customer`. The record size is fixed and the size of one record is 46 bytes. If the records do not cross block boundaries, and the disk block is 512 bytes with the block pointer size 10 bytes long, what is the maximum number of records can be stored in one block?

a) 9

b) 10

c) 11

d) 12

Solution - 18

Answer: b)
Explanation: Size of one record is 46 bytes.
Size of one block is $= 512$ bytes
Size of block pointer is $= 10$ bytes
available space to store data $= 512 - 10 = 502$
Records do not cross block boundaries. Hence, maximum $502 \div 46 = 10$ records can be stored in one block.

Question - 19

An operating system uses the `Least Recently Used (LRU)` strategy for replacing its buffer. Suppose, the system allocates `3 free main memory buffer blocks` for the execution of a query. If the query requires the following disk blocks to access to complete its execution:

`2, 5, 3, 5, 4, 5, 3, 2, 9, 3, 5, 3, 1, 2`

What will be the image of those 3 buffer blocks after servicing the disk block `'9'`?

a)

4	2	9

b)

9	5	3

c)

2	5	9

d)

2	9	3

Solution - 19

Answer: d)

Explanation:

As the query has 3 buffer blocks, the allocation of those blocks with requirements are as follows:

Requirement Details	Buffer Blocks		
2 - not available, 2 will placed to an empty block	2		
5 - not available, 5 will placed to an empty block	2	5	
3 - not available, 3 will placed to an empty block	2	5	3
5 - available	2	5	3
4 - not available, in LRU 2 is used least and will be replace by 4	4	5	3
5 - available	4	5	3
3 - available	4	5	3
2 - not available, in LRU 4 is used least and will be replace by 2	2	5	3
9 - not available, in LRU 5 is used least and will be replace by 9	2	9	3
.	.	.	.
.	.	.	.
.	.	.	.

Hence, after servicing block '9', the image of the buffers is as follows: | 2 | 9 | 3 |

So, option (d) is correct.

Question - 20

Which of the following statements are false about the `Buffer Manager`?

a) Programs call the buffer manager when they only need to transfer a block to disk.

b) If the block is already in the buffer, buffer manager will do nothing.

c) If the block is not in the buffer, the buffer manager allocates space in the buffer for the block.

d) For allocating the space, sometimes the buffer manager replace some other block also.

Solution - 20

Answer: a), b)

Explanation: If the block is not in the buffer, the buffer manager- allocates space in the buffer for the block.

- Replacing (throwing out) some other block, if required, to make space for the new block.

Refer Module 25. So, statements given in options c) and d) are true.

Task of buffer manager is - programs call the buffer manager when they need a block from disk and if the block is already in the buffer, buffer manager returns the address of the block in main memory.

So, options a) and b) are the answer.