

First term Data processing E-Lesson Note

SUBJECT: DATA PROCESSING

CLASS: SS3

SCHEME OF WORK

WEEK	TOPIC
1	REVISION
2	INDEXES:- Definition, Clustered versus Unclustered indexes
3	INDEXES:- Dense versus Sparse, Primary and Secondary Indexes, Indexes using Composite Search Keys
4	MAINTENANCE OF COMPUTER:- Computer Hardware, Process Of Maintaining Hardware
5	MAINTENANCE OF COMPUTER:- Procedure for Software Maintenance, Software for Hardware and Software Maintenance
6	DATABASE SECURITY:- Definition and Explanation, Access Control and Encryption
7	DATABASE SECURITY:- Importance, Integrity and Availability, the Role of a Database Administrator
8	CRASH RECOVERY:- Introduction to ARIES, other Recovery Related Data Structure.
9	CRASH RECOVERY:- Definition and Explanation of Check Pointing, Explain Media Recovery
10	REVISION
11	EXAMINATION

REFERENCE TEXTBOOK: UNDERSTANDING DATA PROCESSING for SENIOR SECONDARY SCHOOLS
BY: DINEHIN VICTORIA

WEEK ONE REVISION

DEFINITION OF DATA MODEL

Is the process of structuring and organizing data.

TYPES OF DATA MODELS

(1) Flat (2) Hierarchical (3) Network (4) Relational (5) Object-Relational and (6)Star Schema

SIGNIFICANCE OF DATA MODEL

- (1) A well-developed data model can foster improved understanding of the organization
- (2) Data model helps in structuring and organizing of data
- (3) It imposes constraints or limitations on the data placed within the structure

STANDARD DATA MODEL

A standard data model or industry standard data model is a data model that is widely applied in some industry and shared amongst competitors to some degree. Examples are: ISO 10303, ISO 15926, IDEAS GROUP

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NORMALIZATION

Is the process of efficiently organizing data in a database by reducing duplication or redundancy and design flaws.

NORMAL FORM

Provide criteria for determining a table's degree of vulnerability to logical inconsistencies and anomalies.

CLASSES OF NORMAL FORM

1st, 2nd, 3rd, BNC, 4th and 5th normal forms

DETERMINANT OF NORMAL FORM

- (1) The minimal number of attributes necessary to support the data requirements of the enterprise
- (2) Attributes with a close logical relationship are found in the same relation
- (3) Minimal redundancy with each attribute represented only once with the important exception of attributes that form all or part of foreign keys.

EVALUATION

1. Define data model
2. State types of data model

CONCEPT OF KEYS

PRIMARY KEY

Is the attribute used to identify a record uniquely in a table or database

COMPOSITE PRIMARY KEY

Two or more keys used as a primary key

FOREIGN KEY

Is the field or attribute of a table that matches the primary key of another table.

ENTITY RELATIONSHIP DIAGRAM (ERD)

Is the diagram that illustrates the logical structure of a database.

Components of Entity-Relationship (1) Entities (2) Attributes (3) Relationships

ENTITY

Is anything for which data can be written about in a business.

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ATTRIBUTES

Are data elements that have the smallest units of data that can be described in a meaningful manner.

RELATIONSHIP

Is an association among the instances of one or more entity types

CARDINALITY

Defines the relationships between the entities in terms of numbers.

TYPES OF RELATIONSHIP

One-to-One, One-to-Many, Many-to-Many

GENERAL EVALUATION

1. (a) Define data model?
(b) State types of data model
(c) Use the following data to draw a hierarchical data model: Fruit; Orange, Pear, Berry; Lime, Grape, Avocado, Sour Sop, Raspberry, Cranberry [Hints: Lime and Grape are children of Orange, Avocado, and SoarSop are children of Pear while Raspberry and Cranberry are children of Berry]
2. (a) State five (5) classes of normal forms
(b) Bring the table below to Second Normal Form

TABLE PURCHASE

CustomerID	StoreID	Purchase Location
1	1	Lagos
1	3	Kano
2	1	Lagos
3	2	Abuja
4	3	Kano

Hint: This table has a composite primary key [CustomerID, StoreID]

WEEKEND ASSIGNMENT

1. Data models describe data for storage in data management systems (a) structured (b) unstructured (c) integer (d) alphabetic
2. Which of this is not an example of standard data model (a) ISO 10303 (b) ISO 15926 (c) IDEAS GROUP (d) Good shepherd
3. key is a field in a relational table that matches a primary key of another table (a) foreign (b) surrogate (c) primary (d) candidate

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4. is graphical representation of entities and their relationships to each other
(a) Entity-Relationship Diagram (b) Entity-Relationship Picture (c) Entity-Relationship Data (d) Entity-Relationship Symbol
5. A roof covers a building describesrelationship (a) one-to-one (b) one-to-many (c) many-to-many (d) none of the above

THEORY

1. (a) Define the following terms (i) Entity (ii) Attribute (iii) Relationship
(b) What is cardinality?
(c) Mention and explain three types of relationship in ERD with one example each
2. (a) Define the following (i) Primary key (ii) Foreign key (iii) Composite primary key
(b) Explain the term Normal Form.
(c) Design a database of your choice indicating the primary key and the foreign key

WEEK TWO INDEXES

DEFINITION

An Index is a copy of database table that has been reduced to certain fields and the copy is always in sorted form. The index also contains a pointer to the corresponding record of the actual table so that the fields not contained in the index can also be read. Index contains a value and a pointer to first record that contains data value.

A Database Index is a data structure that speeds up certain operation on a file. The Operation involves a search key which is the set of record files(in most cases a single field). The elements of an index are called **data entries**. Data entries can be actual data record. A given file of data records can have several indexes, each with different search keys as showed in the table below.

Customer ID	Name	Address	City	State	Zip
001	Mr Daniel	10, Bale str.	Maryland	Lagos	1011
002	Mrs Okon	5, Oju-ile	Ota	Ogun	1021
003	Mr David	26, Dalemo str.	Ikeja	Lagos	1023

The search engine searches for a value in table or file in two ways. The **table scan** which is sequential and **index** which is random.

Indexes are special lookup tables that the database engine uses to speed up data retrieval. An index in a database is similar to an index in the back of a book.

An index table or file consists of records called **index entries**. It is of the form

Search- key	Pointer
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The search key field is used to sort the rows (in the index column) and the pointer field (in index column) indicates where the actual data in the table will be retrieved. When a table has an index it simply means the records in that table has been sorted in one way or the other. Indexes are automatically created when primary key and unique constraints are defined on table columns.

EVALUATION

1. What is an index?
2. What are data entries?

INDEX CLASSIFICATION

Index can be classified as either **clustered** or **unclustered**.

CLUSTERED

Clustered index is an index whose sorting order determines the order of how the rows/records in a table are stored. There could be only one clustered index in a table because there could always be one way of arranging the records in a table at a given time. For example, if you are asked to arrange some tables in a room, you could arrange them in a round form, row form or packed them close together, only one way at a time. Clustered index also means that related values in a table are stored close to each other according to the order of the index.

1. CLUSTERED INDEX

A Clustered index is when a file is organized so that the ordering of data records is the same as or closes to the ordering of data entries. A clustered index can take place only if the data records are sorted on the search key field. For example, suppose that students records are sorted by age; an index on age that stores data entries in sorted order by age is a clustered index.

Indexes that maintain data entries in sorted order by search key use a collection of index entries, organized into a tree structure to guide searches for data entries. Thus, clustered indexes are relatively expensive to maintain when the file is updated, when data entries are to be moved across pages, and if records are identified by a combination of page id and slot as is often the case, all places in the database that point to a moved record must also be updated to point to the new location. These additional updates can be time consuming.

The table below illustrate a clustered index file:

Student ID	Name	Age
00231364OJ	Olu Jacob	12
00241265AF	Agu Faith	13
00251057AJ	Abiola Joseph	13
00211362MS	Mathew Stephen	14

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00251302TB	TjomasBintu	15
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2. UNCLUSTERED INDEX

This is an index whose sorting order does not determine the order of how the rows/records in a table are stored. This means that the search keys in the index column is sorted in one order while the actual records or rows are sorted in another order or are not sorted at all.

This is an index that is not clustered. A data file can contain several unclustered index. For example, supposing that students records are sorted by age; and if additional index on gpa field is included, it is called unclustered index.

GENERAL EVALUATION

- (1) Explain a database index
- (2) Explain clustered index versus unclustered index.

READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria, Page 254.

WEEKEND ASSIGNMENT

1. is a database table that has been reduced to certain fields. a) Table b) An index c) Table model d) Network model
2. The copy of an index is always in form. a) duplicate b) field c) sorted d) domain
3. The index can take place only if the data records are sorted on the search key field. a) unclustered b) insert c) update d) clustered
4. A can contain several unclustered indexes a) data file b) primary c) check d) index
5. Index contain a value and a) pointer b) sign c) update d) model

THEORY

1. Differentiate between clustered index and unclustered index.
2. State two reasons why clustered index is expensive to maintain.
3. What is an index?

WEEK THREE

INDEXES

DENSE VERSUS SPARSE INDEXES

DENSE INDEX

This is said to be dense if it contains (at least) one data entry for every search key value that appears in a record in the indexed file.

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In a **dense** index, index record appears for every search key value in the file or table. That is every search key in the index column has a particular record it will point to in the table or file.

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For example,

10101			
12121			
15151			
22222			
32343			

10101	OJO	Maths	90000
12121	ANYAOGU	DP	75000
15151	ROBERT	ICT	65000
22222	ADEREMU	Computer	60000
32343	TUNDE	Music	50000

From the figure above, we can see that each search key in the index has a particular record that it points to in the base table

SPARSE INDEX

In a sparse index, each search key does not have a corresponding record it points to but may point to a group of records in the base table. For example:

10101			
22222			
32343			

10101	OJO	Maths	90000
12121	ANYAOGU	DP	75000
15151	ROBERT	ICT	65000
22222	ADEREMU	Computer	60000
32343	TUNDE	Music	50000

From the figure above, search keys such as 12121, 15151 do not have corresponding records in the index but you can search for them through 10101 key to retrieve their records in the base table.

A Sparse Index contains one entry for each page of records in the data file. The index record contains the search key and a pointer to the first data record with that search key value. A Sparse index must be clustered and it is smaller than a dense index.

PRIMARY AND SECONDARY INDEX

PRIMARY INDEX

Primary index is an index defined on a primary key column(s) of a relation with unique constraint which guarantee that the field will not contain duplicate values and determine the order of how the records are physically stored on the disk. Note that this is also called **clustered index**.

This is an index on a set of fields that includes the primary key. Primary index contains records that are usually clustered. A primary index is created for the primary key of a table.

SECONDARY INDEX

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Secondary index is an index defined on a non-key field which may contain duplicate values and as such does not determine the order of how the records are physically stored on a disk. It is also called **non-clustered index**.

For example, in student database, student ID is used to look up for a student as the key, however, one might want to look up for a student using LastName by creating secondary index on that column.

Secondary index is an index that is not a primary index i.e. it does not include primary key. Secondary index can be created on non- key attribute. It contains duplicate data entries.

A Unique index is an index in which the search key contains some candidate key.

EVALUATION

1. Distinguish between dense index and sparse index
2. Explain primary and secondary index

INDEXES USING COMPOSITE SEARCH KEYS

Composite search keys or concatenated keys are when the search key for an index contain several fields. For example, considering a collection of employee records with field name, age and salary stored in sorted order by name. if the search key is composite, an equality query is one in which each field in the search key is bound to a constant. For example, we can ask to retrieve all data entries with age = 20 and sal = 10, the hashed file organization supports only equality queries since a hash function identifies the bucket containing desired records only if a value is specified for each field in the search key.

The search key for an index can contain several fields, such keys are called **Composite Search Keys** or **Concatenated Keys**.

Range Query is the one in which not all fields in the search key are bound to constants. For example, we can ask to retrieve all data entries with age = 20; this query implies that any value is acceptable for the sal _eld. Another example of a range query is when ask to retrieve all data entries with age < 30 and sal > 40

GENERAL EVALUATION

1. Differentiate between a unique index and a range query.
2. What is the difference between primary and secondary indexes?.

READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria, Page 254.

WEEKEND ASSIGNMENT

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1. is an index in which the search key contains some candidate key. a) Unique index b) An index c) composite d) sparse index
2. can be created on a non- key attribute. a) primary index b) dense index c) secondary index d) sparse index
3. A sparse index contains one entry for eachof records in the data file. a) page b) table c) row d) column
4.is the one in which not all fields in the Search key are bound to constant. a) dense index b) composite search key c) secondary index d) range query
5. is when the search key for an index contain several fields. a) primary index b) composite search key c) secondary index d) unique index

THEORY

1. Create a student table with the following fields: name, age, and scores of 5 records. Create an index using a composite keys name and age. (show the table and SQL statements)
2. Discuss the different types of indexing.
3. Differentiate between a unique index and a range query.
4. What is composite search key?

WEEK FOUR

MAINTENANCE OF COMPUTER HARDWARE I

Maintenance of computer hardware is a way of taking care, repairing and replacing broken and failing computer hardware.

Maintenance is necessary on computer to avoid hardware failure or losing valuable information and most times, hardware breaks without notice. Excess heat accelerates the deterioration of the delicate circuits in the system. Dust and dirt are the most common cause of overheating. Thus, cleaning a case is done to prevent components from overheating. Computer hardware components attract dust, dirt, lint, carpet fibres, pet hair and smoke particles. The air from the computer cooling fan contains grime which settles on the components and causes overheating which eventually results in permanent hardware failure.

As a result of this, complete cleaning should be done at least once a year and if the computer is used in hot, dusty moist environment, cleaning must be performed more frequently.

PROCESS OF MAINTAINING COMPUTER HARDWARE

GENERAL COMPUTER CLEANING

Step 1: Always shut down, power off the system before carrying out any computer maintenance.

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Step 2: Never sprays any liquid onto any computer component. Spray or pour the liquid on a lint – free cloth and wipe the PC with the cloth. Avoid product with certain cellulose which will leave streaks on your computer equipment. The use of paper towels or an old rag to clean delicate surfaces of a computer should be discouraged because paper products contain cellulose which can scratch delicate surfaces of your hardware.

Step 3: Use vacuum cleaner to remove dirt, dust, food and hair from keyboards. it is advisable to wear an anti – static wrist strip to reduce the transfer of static electricity from the body to the computer.

Step 4: Do not apply cleaning solution including water directly to computer components.

Step 5: Do not use your breath to blow the dust off the components because your breath contains moisture and the components are not built to be rust- proof.

Step 6: Sometimes, it is necessary to replace fans or physically wipe some computer components.

Step 7: Do not use anything wet or damp inside the computer case.

Step 8: Do not let any component or circuit board inside the computer case get wet or damp.

Step 9: Do not attempt to clean the motherboard with a cloth as it may damage the electrical components. Use a slightly moist cloth to wipe off dust and grime inside the computer case.

Step 10: Do not allow any drink around the machinery.

Step 11: Avoid vibrations and shocks.

TOOLS FOR CLEANING COMPUTER HARDWARE

1. A clean non-abrasive cloth such as microfiber, cotton, T-shirt, cotton handkerchief should be used and avoid using paper towels, dish towels, facial tissue, old rag.
2. Portable vacuum.
3. Appropriate cleaning solution.
4. Cotton swabs.
5. Foam swabs.
6. DVD or CD-ROM cleaner.

EVALUATION

1. State the steps involve in maintaining a computer hardware
2. Mention six tools used in cleaning computer hardware

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HOW TO CLEAN YOUR MOUSE

Step 1: Disconnect the mouse cable from the back of the computer case.

Step 2: Lightly dampen a cleaning cloth with isopropyl alcohol and wipe down the outside of the computer mouse and mouse pad.

Step 3: Remove the bottom cover of the mouse. To this, turn it over and note the directional arrows that indicate the direction of rotation, or how to slide it off. Press with your fingers in the direction of the arrows and then turn the mouse right side up, letting the cover and mouse ball drop into your hand.

Step 4: Wipe the computer mouse ball with a lint-free cloth dampened with isopropyl alcohol. Put it aside.

Step 5: Dampen a swab with isopropyl alcohol and clean between, around and on top the keys. Change swabs as they become dirty. You may need several swabs.

Step 6: Replace the mouse ball and cover.

Step 7: Wipe the mouse cord. Lightly dampen a cleaning cloth with mild soap solution and gently pull the cord through the cloth.

Step 8: Plug the mouse back into the computer.

HOW TO CLEAN YOUR MONITOR

Step 1: Unplug the power supply cord and cable from the back of the monitor and allow it to cool for at least 20 minutes.

Step 2: Vacuum the outside of the monitor, particularly the cooling grooves, holes or slots in the top surface where heavy dust or other debris may have collected. Blow compressed air in short puffs at an angle to the monitor surface. The goal is to remove dust and dirt without letting anything fall into the ventilation holes.

Step 3: Lightly dampen a cloth with a mild soap solution and wipe down the outside plastic portions of the monitor.

Step 4: Clean the monitor cables and power cord while they are disconnected. Lightly dampen a cloth with mild soap solution and gently pull the cables and cords through the cloth.

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Step 5: Check the documentation or call the manufacturer to find out if your monitor screen has anti-glare, or other delicate coatings. If so, ask the manufacturer or cleaning instructions. If it does not have these special coatings you may spray a window cleaner onto a lint-free cloth and wipe it clean. Do not spray directly onto the screen. Chemicals may drip inside the monitor and damage it.

Step 6: For dusty or dirty manufacturing environments use a computer dust cover to protect the monitor

HOW TO CLEAN A KEYBOARD

Step 1: Remove the cable from the back of the computer case.

Step 2: Use a vacuum cleaner to remove debris between the key. If no vacuum is available, turn the keyboard upside down and gently tap on the back side dislodge debris.

Step 3: Aim between the keys and compressed air to remove remaining dust and debris. Use short puffs of air applied at about a 30-45 degree angle to the keyboard surface. Alternate between blowing the keys and tapping the keyboard upside down to dislodge particles until it is clean.

Step 4: Lightly dampen a cloth with a mild soap solution and wipe down the outside of the keyboard. Do not spray soap solution directly onto the keyboard.

Step 5: Dampen a swab with isopropyl alcohol and clean between, around and on top of the keys. Change swabs as they become dirty. You may need several swabs.

Step 6: Wipe the keyboard cord. Lightly dampen a cleaning cloth with mild soap solution and gently pull the cord through the cloth. Dry the cord with a dry cloth.

Step 7: For dusty or dirty manufacturing environments a good keyboard cover is recommended.

BATTERY CHARGING AND REPLACEMENT

This can be divided into two types which are:

- (i) Battery charging and replacement for laptop
- (ii) Battery charging and replacement for PC that used UPS.

HOW TO CHARGE A LAPTOP BATTERY

1. Plug your laptop into the socket and you can leave it there whenever possible.
2. You can recharge your laptop's battery whether the battery is fully drained or not.
3. There is no need to fully drain your laptop's lithium-ion battery every time you use it.

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4. Lithium-ion battery have a rapid-charging option. This option is available either on a custom tab inside the Power Option dialog box or from special battery software that came with your laptop.
5. Do not over charge the battery, charge the battery when is getting low between 20%-10% and do not dry the battery.

FOR PC THAT ARE USING UPS

1. The battery needed to be fully charge before use at least for 4 to 6 hours.
2. Ensure that the UPS is kept in contact o the its electrical ground at all times. Do not over load
3. Do not let the UPS shut down by itself because it can damage battery.

HOW TO CLEAN A DVD DRIVE

1. Purchase DVD laser cleaning kit. The kit is comprised of a single disc that is design to spin in your drive and remove all dust from the lens.
2. Place the CD/DVD laser lens cleaning disc inside your DVD drive's tray. Close the tray and allow the CD spin in the drive. As it spins, it will clear your lens of most, if not all, of the dust that is on it.
3. Purchase a can of spray air. As an extra precaution, open your drive's disc tray and gently spray a can of spray air into it. This will remove any of the big pieces of dust that may be lurking inside the tray.

GENERAL EVALUATION

1. Explain steps for cleaning the following (i) Keyboard (ii) Monitor
2. List steps to clean DVD drive lens.

READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria Pages 245 - 250

WEEKEND ASSIGNMENT

1. Maintenance is necessary on computer to avoid
a) hardware failure b) stealing c) invasion d) crime
2. Excess heat accelerates the deterioration of the delicate in the system. a) vacuum b) transistors c) circuits d) particles
3. Dust and dirt are the most common cause of a) leakage b) overheating c) breakage d) spooling.
4. is used to remove dust, dirt and hair from the keyboard. a) Vacuum cleaner b) Brush c) Old rag d) Paper towels
5. It is advisable to wear an to reduce transferring static electricity from your body to the computer. a) hand glove b) anti – static wrist strip c) coat d) dust cover

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THEORY

1. Explain the steps in cleaning the following: i) Mouse ii) Keyboard iii) Monitor iv) DVD drive lens
2. State six tools used in cleaning computer hardware.

WEEK FIVE

MAINTENANCE OF COMPUTER II

Maintenance is highly essential in order to prolong its contributing functionality.

SOFTWARE MAINTENANCE

The maintenance of programs inside the computer system such as virus, a spyware removal, back up software and a registry removal, cleaner. Every PC should be installed with an anti virus, a spyware removal application back up and a registry cleanser.

Some helpful Tips

- a. Always scan your system once a week.
- b. The hardware should also be defragmented at least once a month.
- c. Delete all temporary files and cookies at regular interval.

TYPES OF SOFTWARE MAINTENANCE

1. Corrective Maintenance
2. Perfective Maintenance
3. Adaptive Maintenance
4. Preventive maintenance

1. CORRECTIVE MAINTENANCE

This type of maintenance involves developing and deploying solution to problems that occur during usage of a software program. For instance, when an error message comes up on the screen or program is hanging or freezing or crashing, this implies that corrective software maintenance is needed. A computer programmer is employed to work on a more permanent solution to the problems.

2. PERFECTIVE MAINTENANCE

This is a measure taken by computer programmer to upgrade the way a software programs function or how fast it processes, requests, develop software menu layouts and command interface so as to ensure that the program has zero tolerance for flaws.

3. ADAPTIVE MAINTENANCE

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It takes care of the changes that occur in software development. For instance, if there is a change in processors speed, thus change will invariably affect how the software performs on a single computer software interfaces with other software programs. So changes in one program necessitates changes in other programs.

4. PREVENTIVE MAINTENANCE

This is a situation whereby computer programmers try to prevent problems with software programs before they occur. They seek to prevent corrective maintenance as well as anticipating adaptive maintenance needs before users encounter problems. This is done by test running their programs to ensure that the software can handle high data loads and other stressful operation without difficulties. Computer programmers also ensure compatibility by testing the software with other programs users that are likely to use their software.

PREVENTIVE MAINTENANCE ACTIVITIES INCLUDE THE FOLLOWING:

- I. Installing anti virus protection software and update
- II. Install firewall on your computer
- III. Keep computer registry up to date.
- IV. Make sure your operating system is up to date
- V. Delete cookies

EVALUATION

1. Discuss the four types of software maintenance.
2. State five benefits of software maintenance.

BENEFITS OF SOFTWARE MAINTENANCE

1. It promotes fully functional and highly reliable computer.
2. If preventive maintenance operations are carried out regularly, a PC will never run slowly or have programs that changes or freezes the computer.
3. When programs like CC cleaners or disk cleanser is used to clean up your hard drive , and also run Defraggler CD disk. Defragment process pack your files that are scattered across your hard drive into configures cluster (Disk Defragmenter), allowing the file system to locate them easily.
4. When a PC is protected and maintained by S/W clean up programs, the hrd drive will not be slow and fragmentation will hardly occur.
5. Registry cleaning.
6. Problems due to lack of maintenance are reduced.

ROUTINE COMPUTER MAINTENANCE

Routine Computer Maintenance consists of tasks performed on computer daily, weekly or monthly in order to keep the computer running efficiently for a long time.

1. Disk cleaning should be done weekly to get rid of “trash”.

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2. Defragmentation- Run defrag which is located in terms tools to pull those fragments into one location.
3. Always update your system
4. Back up with external hard drive and back-up software.
5. Physical maintenance, i.e., regular physical cleaning of the hardware components should be observed.
6. Internet Security: Always run full updated antivirus program when using the internet and also perform full system scan with your anti virus program. It is ideal to run a firewall to block potential threats.
7. Patches and updates: They are regularly released by software companies to tackle security problems found in the programs. System administrators and network technicians should regularly download and apply these updates to ensure that their computers and their networks are protected from hackers, viruses and network intrusions.
8. Apply repair functions.

COMPUTER MAINTENANCE TIPS

1. Never turn your computer off with the power switch on until window has shut down.
2. Get a UPS (Uninterrupted Power Supply) for your computer.
3. Back up your data to external hard drives, DVD/ CD Roms, USB/ drives, memory card etc.
4. Run scan disk and defragment at least once in a month.
5. Never unplug peripheral from the computer when it is on.
6. Ensure that you have 300 mbs or 500-600 mbs of free space on your C Drive for window XP, Vista, or Window 7.
7. Do not allow a lot of programs to load up when you start your computer.
8. Use anti-virus checker regularly.
9. Use a firewall program for a high speed internet connection.
10. Keep track of the software disk you receive with your computer and new peripheral.
11. Make sure window update is set.

GENERAL EVALUATION

1. State five routine computer maintenance.
2. State six computer maintenance tips.

READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria Pages 293 - 297.

WEEKEND ASSIGNMENT

1. Which of the following is not a software maintenance? a) Virus b) Spyware c) Hard disk d) Registry removal

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2. The software maintenance that involves developing and deploying solutions to problems is a) corrective b) adaptive c) preventive d) perfective
3. The software maintenance that takes care of the changes that occur in software maintenance is called a) adaptive b) corrective c) perfective d) preventive
4. Disk cleaning should be done a) hourly b) daily c) weekly d) yearly
5. Patches and update are regularly released by software companies to tackle security problems found in a) programs b) hardware c) people ware d) peripheral

THEORY

1. List and explain the four software maintenance.
2. State four benefits of software maintenance
3. State three routine computer maintenance

WEEK SIX AND SEVEN DATABASE SECURITY

DEFINITION OF DATA SECURITY

Data security is the practice of keeping data protected from corruption and unauthorized access. The focus behind data security is to ensure privacy while protecting personal or corporate data.

It is a means of putting in place the different form of information security controls to protect database against compromise of their confidentiality, integrity and availability.

RISK ASSESSMENT

This will enable you to identify the risks you are faced with and what could happen if valuable data is lost through theft, malware infection or a system crash.

SECURING DATA

Since data can be compromised in many ways, the best security against misuse or theft involves a combination of technical measures, physical security and a well-educated staff. You should implement clearly defined policies into your infrastructure and effectively present them to the staff.

TYPES OF SECURITY CONTROL ON THE DATA

1. Access Control

Is the selective restriction of access to a place or other resource. The act of accessing may mean consuming, entering, or using. Permission to access a resource is called authorization.

2. Auditing

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Database auditing involves observing a database so as to be aware of the actions of database users. Database administrators and consultants often set up auditing for security purposes, for example, to ensure that those without the permission to access information do not access it.

3. Authentication

Is the validation control that allows you to log into a system, email or blog account etc. Once logged in, you have various privileges until logging out. Some systems will cancel a session if your machine has been idle for a certain amount of time, requiring that you prove authentication once again to re-enter. You can log in using multiple factors such as a password, a smart card or even a fingerprint.

4. Encryption

This security mechanism uses mathematical scheme and algorithms to scramble data into unreadable text. It can only be decoded or decrypted by the party that possesses the associated key.

5. Back Up

This is the process of making copy and archiving of computer data in the event of data loss which is used to restore the original data.

6. Password

This is sequence of secret characters used to enable access to a file, program, computer system and other resources.

EVALUATION

1. Explain data security.
2. Explain types of security control on data that you know

IMPORTANCE OF DATA SECURITY

Data security is critical for most business and even home computer users. Client information, payment information, personal files, bank account details- all this information can be hard to replace and potentially dangerous if it falls into the wrong hands. Data lost due to disaster such as a flood or fire is crushing, but losing it to hackers or a malware infection can have much greater consequences.

MAJOR THREATS TO DATA SECURITY

- a. Accident can happen due to human error or software/ hardware error.
- b. Hackers could steal vital information and fraud can easily be perpetrated.
- c. Loss of data integrity.
- d. Improper data access to personal or confidential data.
- e. Loss of data availability through sabotage, a virus, or a worm.

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INTEGRITY CONTROLS

BACKUPS

Is the process of copying and archiving of computer data so it may be used to restore the original after a data loss event.

Backupshave two distinct purposes. The primary purpose is to recover data after its loss, be it by data deletion or corruption. The secondary purpose of backups is to recover data from an earlier time, according to a user-defined data retention policy, typically configured within a backup application for how long copies of data are required. Backup is just one of the disaster recovery plans.

APPLICATION SECURITY

Application security is the use of software, hardware and procedural methods to protect application from external threats.

THE ROLE OF DATABASE ADMINISTRATOR IN DATA SECURITY

A database administrator (DB) is a person responsible for the installation, configuration, upgrade, administration, monitoring and maintenance of databases in an organization. The role includes the development and design of database strategies, system monitoring and improving database performance and capacity, and planning for future expansion requirements. They may also plan, co-ordinate an implement security measures to safeguard the database.

A database administrator's responsibilities can include the following tasks:

3. Installing and upgrading the database server and application tools.
4. Allocating system storage and planning future storage requirements for the database system
5. Modifying the database structure, as necessary, from information given by application developers.
6. Enrolling users and maintaining system security.
7. Ensuring compliance with database vendor license agreement.
8. Controlling and monitoring user access to the database.
9. Monitoring and optimizing the performance of the database.
10. Planning for backup and recovery of database information.
11. Maintaining archive data.
12. Backing and restoring databases.
13. Contacting database vendor for technical support.
14. Generating various reports by querying database as per need.

GENERAL EVALUATION

1. Define the roles of a database administrator in data security
2. Define backup and list its importance in data security

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READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria Pages 255 - 260

WEEKEND ASSIGNMENT

1.is the practice of keeping data protected from corruption and unauthorized access. (a) Data measurement (b) Data security (c) Data protection (d) Data control
2. Which of these is not a type of security control?(a) access control (b) auditing (c) encryption(d) storage
3. security mechanism uses mathematical schemes and algorithm to scramble data into unreadable text. (a) Encryption (b) Auditing (c) Authentication (d) Auditing
4. is the process of copying and archiving data so it may be used to restore original after a data loss (a) Backup (b) Restore (c) Control (d) Saving
5. is the computer professional responsible for the configuration, administration and maintenance of a database (a) Programmer (b) System administrator (c) Database administrator (d) System analyst

THEORY

1. Explain two types of data security control.
2. Mention five (5) duties of a database administrator.

WEEK EIGHT AND NINE CRASH RECOVERY

DEFINITION

Crash recovery is the process by which the database is moved back to a consistent and usable state. This is done by rolling back incomplete transactions and completing committed transactions that were still in memory when the crash occurred. When the database is in a consistent and usable state, it has attained what is known as **a point of consistency**. Following a transaction failure, the database must be recovered.

CONDITIONS THAT CAN RESULT IN TRANSACTION FAILURE INCLUDE:

1. A power failure on the machine causing the database manager and the database partitions on it to go down.
2. A hardware failure such as memory corruption, or disk, CPU, or network failure.
3. A serious operating system error that causes the DB to go down

INTRODUCTION TO ARIES (ALGORITHMS FOR RECOVERY AND ISOLATION EXPLOITING SEMANTICS)

First term Data processing E-Lesson Note

ARIES

This is a recovery algorithm designed to work with no-force, steal database approach. It is used by IBM DB2, MS SQL Server and many other database systems.

The three main principles that lie behind ARIES recovery algorithm

1. Write Ahead Logging: Any change to an object is first recorded in the log, and then the log must be written to a stable storage before changes to the object are written to a disk.
2. Repeating History during Redo: On restart, after a crash, ARIES retraces the actions of a database before the crash and brings the system back to the exact state that it was in before the crash. The n it undoes the transaction still active at crash time.
3. Logging Changes during Undo: Change made to the database while undoing transactions are logged to ensure such an action isn't repeated in the event of repeated restarts.

RECOVERY PROCEDURE AFTER CRASH

The recovery works in three phases

1. Analysis Phase: The first phase, analysis, computes all the necessary information from the log file.
2. REDO Phase: The Redo phase restores the database to the exact state at the crash, including all the changes of uncommitted transactions that were running at that point time.
3. UNDO Phase: The undo phase then undoes all uncommitted changes, leaving the database in a consistent state. After the redo phase the database reflects the exact state at the crash. However, the changes of uncommitted transactions have to be undone to restore the database to a consistent state.

EVALUATION

1. Define crash recovery.
2. Explain the term ARIES.

OTHER RECOVERY RELATED TO DATA STRUCTURE

THE WRITE-AHEAD LOG PROTOCOL

Write Ahead Logging (WAL) is family of techniques for providing atomicity and durability (two of the ACID properties) in database systems. In a system using WAL, all modifications are written to a log before they are applied. Usually both redo and undo information is stored in the log. WAL allows updates of a database to be done in one place.

ATOMICITY

This is the property of transaction processing whereby either all the operations of transactions are executed or none of them are executed (all-or-nothing)

First term Data processing E-Lesson Note

DURABILITY

This is the ACID property which guarantees that transactions that have committed will survive permanently.

LOG

A transaction log (also transaction journal, database log, binary log or audit trail) is a history of actions executed by a database management system to guarantee ACID properties over crashes or hardware failure. Physically, a log is a file of updates done to the database, stored in stable storage.

CHECK POINTING

Check pointing is basically consists of storing a snapshot of the current application state, and later on, use it for restarting the execution in case of failure. A check point record is written into the log periodically at that point when the system writes out to the database on disk all DBMS buffers that have been modified. This is a periodic operation that can reduce the time for recovery from a crash.

Check points are used to make recovery more efficient and to control the reuse of primary and secondary log files. In the case of crash, backup files will be used to recover the database to the point of crash.

MEDIA RECOVERY

Media recovery deals with failure of the storage media holding the permanent database, in particular disk failures. The traditional database approach for media recovery uses archive copies (dumps) of the database as well as archive logs. Archive copies represent snapshots of the database and are periodically taken.

The archive log contains the log records for all committed changes which are not yet reflected in the archive copy. In the event of a media failure, the current database can be reconstructed by using the latest archive copy and redoing all changes in chronological order from the archive log.

A faster recovery from disk failures is supported by disk organizations like RAID (redundant arrays of independent disks) which store data redundantly on several disks. However, they do not eliminate the need for archive based media recovery since they cannot completely rule out the possibility of data loss, e.g when multiple disk fail.

GENERAL EVALUATION

1. Explain crash recovery.
2. Explain the following terms in crash recovery (i) Media recovery (ii) Check point (iii) The Write - Ahead log protocol
3. Discuss the concepts of ARIES in crash recovery.

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READING ASSIGNMENT

Understanding Data Processing for Senior Secondary Schools by Dinehin Victoria Pages 261 – 267

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WEEKEND ASSIGNMENT

1. The process by which a database is moved back to a consistent and usable state is called..... (a) cash recovery (b) crash recovery (c) past recovery (d) undo recovery
2. The recovery algorithm that uses no-force and steals approach is
(a) ARIAS (b) ARIES (c) ARREARS (d) ARIS
3. ARIES works in Phases (a) 3 (b) 2 (c) 1 (d) 4
4. Which of these is not a crash recovery type
(a) ARIES (b) Media recovery (c) Check pointing (d) UNDO
5. Crash recovery uses backup files (a) Check point (b) ARIES (c) Media recovery (d) Atomicity

THEORY

1. Discuss the concept of ARIES in crash recovery.
2. Explain the difference between media recovery and check point.
3. Explain the difference between a system crash and a media failure.