

LECTURES' EXERCISES SOLUTIONS

Lecture (1)

- Define:

1. Cause programs to run slowly or miscalculate. (Errors)
2. Subcontracting portions of job to a third party to reduce cost and time. (Outsourcing)
3. Learning without requiring students to be at specific location at specific time. (E-learning)
4. Unauthorized reproduction and distribution of computer-based media. (Digital piracy)
5. Enable users connected to a computer network to have access to the network's programs, hardware, and data. (Server)
6. Consists of four operations: Input, Processing, Output and Storage (Information-processing cycle)
7. Replacement of people by machines and computers. (Automation)
8. Field of study concerned with the fit between people and their work environment. (Ergonomics)
9. Device that performs the information-processing cycle. (Computer)
10. An economic and social inequality with regard to access to and use of Information and Communication Technology (ICT). (Digital divide)

- Sort descending according to processing power:

Minicomputer, supercomputer, mainframe, microcomputer.

Supercomputers, mainframe, minicomputers, microcomputers

- **Differentiate between:**

1. **Data and information:**

Data	Information
<ul style="list-style-type: none">-Facts that are raw and unorganized.-Entered into the computer for processing through the use of input devices such as a keyboard or mouse.	<ul style="list-style-type: none">-When data is processed, organized, structured.-The central processing unit (CPU) processes data into information.

2. **Server and Client:**

Server	Client
Enable users connected to a computer network to have access to the network's programs, hardware, and data	include the user computers connected to the network

3. **Microcomputers and Supercomputers:**

Microcomputers	Supercomputers
<ul style="list-style-type: none">-Designed for home or office use.-Small.-inexpensive.	<ul style="list-style-type: none">-Designed for big companies or businesses.-Able to perform extremely high-speed processing and show underlying patterns.-Huge.-expensive.

- **List:**

1. **Types of individual computers.**

Desktop computers - Portable computers - Wireless devices

2. **Advantages and disadvantages of computer use.**

Advantages	Disadvantages
<ul style="list-style-type: none">-Speed-Memory-Storage-Hardware reliability and accuracy	<ul style="list-style-type: none">-Information overload-Cost-Data inaccuracy-Software unreliability

3. Examples on collaborative software.

Google docs - Google groups - Wiki

4. Examples on how to be a responsible computer user.

-Understand how your computer use affects others.

-Obey laws and conform to requests regarding use of cell phones.

-Be aware of e-waste and the proper disposal of outdated computer hardware.

5. Examples on storage devices.

Hard drives, CD and DVD drives, and media card readers—used with USB drives and flash memory cards

Lecture (2)

- List the four operations of the processing cycle and provide a brief description of their function.

-**Fetch:** Retrieves program instructions

-**Decode:** Determines what the program is telling computer to do

-**Execute:** Performs the requested action

-**Store:** Stores the results to an internal register

- What is the difference between registers and primary cache?

-**Registers:** store data when it must be temporarily stored in the CPU

-**Primary cache:** a small unit of fast memory found in the processor chip to improve performance

- List three to five factors that affect the performance and speed of a computer.

1- The number of existing transistors

2- Data bus width and word size

3- Clock speed

4- Operations per microprocessor cycle

5- Use of parallel processing

6- Type of chip

- **What is the difference between pipelining and parallel processing?**

-Pipelining: enables the CPU to process more than one instruction at a time, which improves CPU performance

-Parallel processing: a method in which more than one processor performs at the same time, resulting in faster processing

Lecture (3)

• Differentiate between:

1. Positioning and Transfer performance:

Positioning performance	Transfer performance
How quickly the read/write head can get into position to transfer data.	How quickly the transfer is made from the disk to RAM

2. Primary and Secondary storage:

Primary storage	Secondary storage
<ul style="list-style-type: none">-Temporary holding area for items in use-Low-capacity-Example : RAM	<ul style="list-style-type: none">-Required during the computer system's start-up operations-Used for saving data-High-capacity-Example : Hard drive

3. CRT and LCD displays:

CRT displays	LCD displays
<ul style="list-style-type: none">-Legacy technology-Very bulky (<i>large and heavy</i>)-Usually connected to older desktop computers	<ul style="list-style-type: none">-Are used with newer desktops and notebooks-Have a thin profile

4. Inkjet and Laser printers:

Inkjet printers	Laser printers
<ul style="list-style-type: none">-Popular with home users-Provide excellent images—made up of small dots-Advantages:<ul style="list-style-type: none">o Inexpensiveo Generate professional color output-Disadvantages:<ul style="list-style-type: none">o Relatively slow	<ul style="list-style-type: none">-Use electrostatic reproductive technology to produce high-quality output-Advantages:<ul style="list-style-type: none">o High-resolutiono Print faster than inkjet printerso Black-and-white printing costs less per page than inkjet printing-Disadvantages:<ul style="list-style-type: none">o Color laser printers more expensive

• **Match:**

COLUMN [A]		COLUMN [B]	
1	Character Map	A	Grid of circuits located under the keys
2	Partitions	B	On-screen symbol that signifies the command, input, or possible response
3	Key matrix	C	Generates an image of a full-sized keyboard onto almost any surface
4	Pointer	D	Rapidly rotating disks on which programs, data, and processed results are stored
5	Resolution	E	Chart that tells the processor what key has been pressed
6	Platters	F	Portion of a hard disk set aside as if it were a physically separate disk
7	Virtual Laser	G	Number of pixels which controls sharpness of image

SOLUTION: 1-E 2-F 3-A 4-B 5-G 6-D 7-C

• **Complete:**

- Optical storage devices use laser beams to store data through **Pits** and **Lands**.
- Upon data request, CPU looks in **disk cache** first before the hard disk.
- Dot-matrix** printers are used mostly for printing multipart forms and backup copies.
- Flash drive (Solid-State Drive [SSD])** are storage devices that use solid-state circuitry, which have no moving parts.
- Express Card** is a notebook accessory which can be used as a modem, as an extra memory, or as a network adapter.
- Damaged portions of the disk that cannot reliably hold data are called **bad sectors**.
- A **USB flash drives** is a storage device that do not require a device driver.

- **True/False:**

1. Dot matrix printer is mainly used for making oversized prints (i.e., maps, charts). **[False]**
2. BD format offers more than five times the storage capacity of traditional DVDs. **[True]**
3. Backup is to copy programs, data, and information created in one secondary storage medium to another medium. **[True]**
4. CD-ROM is a popular, inexpensive media that enables recording and erasing data. **[False]**
5. Using the disk cache slows down data retrieval because of extra disk cache check. **[False]**

- **Sort in ascending order according to access speed:**

HD, CD-R, RAM, cache memory.

CD-R, HD, RAM, cache memory

Lecture (5)

- Match:

COLUMN [A]		COLUMN [B]	
1	System utilities	A	Database that stores information about software and peripherals choices, for configuration information
2	Kernel	B	Confirm that both the computer and its peripheral devices are working properly
3	Embedded OS	C	An emergency disk to load the operating system for emergencies
4	Registry	D	A backup that includes only those files changed or added since the previous backup
5	Boot disk	E	Software programs responsible for backing up & compressing files and providing antivirus protection
6	Power-on self-test	F	Found on ROM chips in portable or dedicated devices
7	Incremental backup	G	Central part of OS

SOLUTION: 1-E 2-G 3-F 4-A 5-C 6-B 7-D

- True/False:

1. Compression utilities create archives by storing files in a special format. **[True]**
2. BIOS is encoded on RAM. **[False]**
3. A bad sector represents an irregularity on the disk's surface which causes a portion of the disk to unreliably store data. **[True]**
4. An interrupt handler holds responses from multiple interrupts in RAM, where the OS processes them in highest to lowest priority order. **[False]**
5. RAM memory functions as the buffer. **[True]**

6. Preemptive multitasking ensures all applications have fair access to the hard disk. **[False]**

7. Server OS eliminates many unneeded features of OSs used in client/server environments. **[False]**

- **List:**

1. Categories of OS.

- **Stand-alone OSs:** used by single users
- **Server OSs:** used in client/server network environments
- **Embedded OSs:** found on ROM chips in portable or dedicated devices

2. Types of user interfaces.

- **Graphical user interface (GUI)**
- **Menu-driven user interface**
- **Command-line user interface**

3. Examples on system utilities.

- **Backup software - Antivirus software - Searching for and managing files - Scanning and defragmenting disks - File compression utilities - Accessibility utilities - System update - Troubleshooting - Safe Mode - Reliability and Performance Monitor - Help and Support**

4. Power modes.

- Sleep mode - Hibernate mode - Hybrid sleep**

- **Complete:**

1. **Pages** are units of fixed size which contain program instructions and data.
2. **Interrupts** are signals created by input and output devices to notify the OS when actions are taken.
3. **Embedded OS** is a compact and efficient OS used in PDA and cell phones.
4. **Backup** copies data found on the hard disk to another device.
5. Accessing data from hard disk is **slower** than accessing from RAM.
6. When RAM is full, copies of pages are temporarily stored in a **swap file**, a special hard disk file.

- **Differentiate between:**

1. Cold and warm boot:

Cold boot	Warm boot
Starting computer when it has not yet been turned on	Restarting a computer that is already on

2. Full and incremental backup:

Full backups	Incremental backups
Include all files and data	Include only those files changed or added since the previous backup

3. Disk cleanup and defragmentation:

Disk cleanup	Disk defragmentation
Improves system performance and increases storage space by removing files that you no longer need	reorganize stored data in a more efficient manner

4. User profile and account:

Profile	Account
A record of a specific user's preferences for the desktop theme, icons, and menu styles	For multiuser computer systems, each user has an account - Consists of user name, password, and storage space - Created by server/computer administrator

5. Interrupt handler and vector table:

Interrupt handler	Vector table
Mini-programs that immediately respond when an interrupt occurs	In case of multiple interrupts, it holds responses from multiple interrupts in RAM, where the OS processes them in highest to lowest priority order

6. Operating system and system utilities:

Operating system	System utilities
-Five basic functions: 1. Starts the computer 2. Manages applications 3. Manages memory 4. Handles input and output device messages 5. Provides a user interface for communication -OS coordinates: 1. Interactions of hardware components to each other 2. Interactions between application software and computer hardware	-Software programs essential to effective management of the computer system -Perform tasks such as: o Backing up files o Providing antivirus protection o Searching for and managing files o Compressing files o Providing accessibility utilities to individuals with special needs

7. Backup and troubleshooting utilities:

Backup utilities	Troubleshooting utilities
Copies data found on the hard disk to a backup device such as flash drives, DVDs, external HD, or online storage location	Keep a boot disk (emergency disk)—to load a reduced version of the OS that can be used for troubleshooting purposes

8. Single and multi-tasking OSs:

Single-tasking OSs	Multi-tasking OSs
Run only one application at a time	Permit more than one application to run at same time

9. Sleep and safe modes:

Sleep mode	Safe mode
Transfers the current state of your computer to RAM, turn off all unneeded functions, and place the system in a low-power state.	-Windows loads a minimal set of drivers known to function correctly -Use Control Panel to discover devices that are causing the problem

- **When you start or restart a computer, it reloads OS into the computer's memory. A computer goes through six steps at startup. Sort them.**

- A. Loading the OS
- B. Loading the BIOS
- C. Loading system utilities
- D. Performing the power-on self-test
- E. Configuring the system
- F. Authenticating users

1. Loading the BIOS
2. Performing the power-on self-test
3. Loading the OS
4. Configuring the system
5. Loading system utilities
6. Authenticating users

Lecture (6)

- Complete:

1. Each **shape** represents a step in the process, while the **arrows** show the order in which they occur.
2. The algorithms can be designed through the use of **flowchart** or **pseudo-code**.
3. The **decision symbol** has two exit points; these can be on the sides or the bottom and one side.
4. Selection structures are called **case** selection structures when there are two or more constants to choose from.
5. If the condition is always true, then you will end up in an **infinite loop**.
6. The statements that execute within a loop are known as the **loop body**.
7. The **connectors** are used in case an upward flow will traverse more than three symbols.
8. In the **Selection (Decision)** design structure, statements can be executed or skipped depending on whether a condition evaluates to True or False.
9. The **increment (update) section** in the FOR loop handles changing the value of the variable.
10. The **Do While** loop is used when processes should be executed at least once.
11. In flowchart, the **Decision** symbol is used to ask a question that can be answered with binary format.

- **Which Loop to Use?**

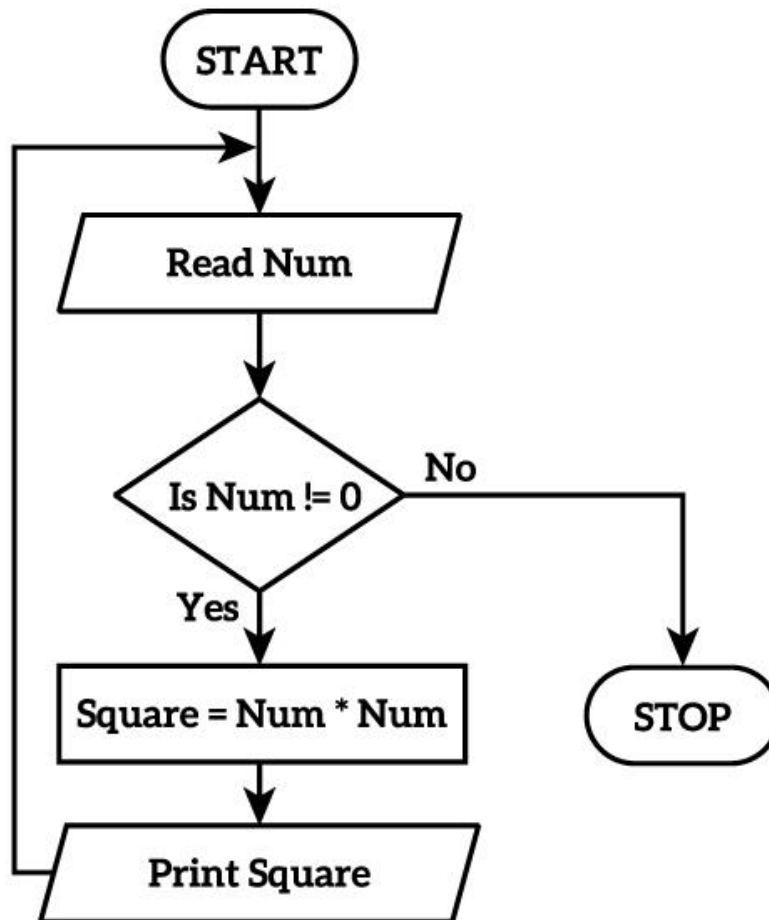
A company calculates the weekly wages of its workers. The user submits the number of normal and overtime hours of the workers. Payment for normal working hour is 14 while for overtime working hour is 18...

1. If the number of workers is 10: **[For]**
2. If the user enters many workers and wants to choose when to stop: **[While]**
3. If we know that the company has at least one worker and the user wants to choose when to stop: **[Do While]**

- **Put True (T) or False (F):**

1. All boxes of the flowchart are connected with lines. **[False]**
2. The WHILE loop is used in case the program performs an indefinite number of iterations, as long as a certain condition remains true. **[True]**
3. Nested IF is used in case of multiple embedded decisions. **[True]**
4. An algorithm can be defined as a difference between a desired situation and current situation. **[False]**
5. The FOR loop is used in case the program performs an indefinite number of iterations and does not need a condition at the start. **[False]**
6. Every Nested IF can be represented using Case selection. **[False]**

- Draw a flowchart for program that will output the square of any number input until the number input is zero.



Lecture (7)

- Complete:

1. The **coding** phase of PDLC includes identifying syntax errors.
2. Testing all possible logic paths in the software unit, with thorough knowledge of the logic is called **White-box testing**.
3. **Non-Procedural Languages** allows complex operations to be processed in one statement, e.g. report generators and query languages.
4. **Dynamic** testing checks functional behavior of SW by entering test data and comparing results to expected results.
5. **Mnemonics** are brief abbreviations for program instructions that make assembly language easier to use.
6. Interviews, questionnaires and observation are employed in the **Analysis** phase of PDLC.
7. **Syntax** is the vocabulary and rules of a programming language.
8. **Machine Language** is the only programming language that a computer (CPU) understands directly.
9. **Compiler** converts source code into object program.
10. **Syntax errors** are mistakes in construction of programming commands which must be corrected for program runs.
11. **Deployment and Maintenance** are the processes involved in getting new SW up and running properly in its environment.
12. **Machine Language** and **Assembly Language** are machine dependent languages.
13. **Spaghetti** code is full of GOTO statements, which make code difficult to follow and prone to errors.
14. The compilation process takes **longer** the time than the interpretation process.

15. **Black-box** testing is conducted when tester has no knowledge of code.
16. Assessing the functionality of SW program is called **testing**.
17. The main purpose of **Desk Checking** the algorithm is to identify major logic errors early to be easily corrected.
20. Evaluating the program on a regular basis is called **Maintenance**.
21. **Interpreter** translates source code one line at a time and execute instructions without creating machine code.
22. Phases of PDLC are **Analysis, Design, Coding, Testing** and **Deployment**.

● **Differentiate between:**

1. Source and machine code:

Source code	Machine code
The programming instructions in their original form, which need to be translated into a form that the computer can understand.	<ul style="list-style-type: none">- Based on binary numbers- The only programming code that a computer (CPU) understands directly

2. White and black box testing:

White-box testing	Black-box testing
<ul style="list-style-type: none">- Testing all possible logic paths in the software unit.- Deep knowledge of the logic.- Makes each program statement execute at least once.	<ul style="list-style-type: none">- Tester has no knowledge of code.- Often done by someone other than the coder.

3. Logic and syntax errors:

Logic errors	Syntax errors
Bugs that cause program to run incorrectly and produce undesired outputs.	<ul style="list-style-type: none">- Mistakes in the construction of the programming commands. Must be corrected for the program to run

4. Compiler and interpreter:

Compiler	Interpreter
Translate source code into object code (object program)	Translate source code one line at a time and execute instructions without creating an object code

5. Dynamic and static testing:

Dynamic testing	Static testing
Check the functional behavior of a SW unit by entering test data and comparing results to the expected results	Manual or automated review for: <ul style="list-style-type: none">- Code (static code reviews)- Requirements and design documents (technical reviews)

Lecture (8)

- Put True (T) or False (F):

1. Writing variables to memory is nondestructive. [False]
2. If we want more than a single statement to be executed in case that the condition is true we can specify a block using braces { } [True]
3. Division by zero and overflow are logic errors. [False]
4. To declare more than one variable of the same type, declare all of them in a single statement by separating their identifiers with commas. [True]

- Complete:

1. Based on the data type of a variable, the operating system allocates memory.
2. Declarative region that provides a scope to identifiers is called namespace.
3. A byte is the minimum amount of memory that we can manage in C++.
4. Compiler creates object code and stores it on disk.
5. The object program is often then linked with other supporting library code to generate an executable file (.exe)
6. Double forward slash (//) indicates a single-line comment.

Lecture (9)

- Complete:

1. Every C++ program begins execution at function **main**.
2. All variables must be given a **data type** when they are declared.
3. The **IF-ELSE** statement is used to make a decision.
4. The **Increase/Decrease** operators can be used as a prefix or as a suffix.
5. The **While** loop is sentinel-controlled.
6. In case statement, the **Default case** is optional.
7. **Conditional Operator** is the only ternary operator in C++.
8. The **continue** statement causes the program to skip the rest of the loop in the current iteration.

- Put True (T) or False (F):

1. C++ considers the variables number and Number to be identical. **[False]**
2. An expression containing the || operator evaluates to true if either or both of its operands are true. **[True]**
3. The default case is required in the switch statement. **[False]**
4. Operators *, / and % have the same evaluation precedence. **[True]**
5. The break statement jumps to the start of the following iteration. **[False]**
6. Any IF-ELSE statement can be represented using switch case. **[False]**

- Are these statements equivalent?

if (isBool = true)

if (isBool)

Answer: No, the first statement should be *if (isBool == true)* so that they become equivalent.

- Differentiate between:

- Continue and Break:

Continue	Break
<ul style="list-style-type: none">- Causes the program to skip the rest of the loop in the current iteration.- Jumps to the start of the following iteration	<ul style="list-style-type: none">- Immediate exit from While, Do-While, For, Switch- Program continues with first statement after structure

- What happens when you omit the default case?

Nothing happens; because it is optional.

- Which loop can be used if the loop body has to be executed before testing the continuation condition?

Do-While loop.

Lecture (10)

- Complete:

1. **C-preprocessor** is a text substitution tool to do required pre-processing before actual compilation.
2. Assembly is considered **Second** generation language.
3. **“cin”** can only process the input from the keyboard once the RETURN key has been pressed.
4. **Logical** errors won't be displayed on the screen, they are caused by incorrect business requirement understanding that will lead to display wrong results.
5. The **Increase/Decrease** operators can be used as a prefix or suffix.
6. **OOP (Object Oriented Languages)** makes information hiding (encapsulation) possible.

- Match:

COLUMN [A]		COLUMN [B]	
1	Natural language	A	Assembly language code
2	Mnemonics	B	First generation
3	Algorithm	C	Prolog
4	Desk checking	D	Creates an object code
5	Connectors	E	Programmers do not have to wait for the entire program to be recompiled each time they make a change.
6	Component reusability	F	OOP
7	Interpreter	G	Steps of solution
8	Machine language	H	Design tool
		I	Links breaks in flowcharts

SOLUTION: 1-C 2-A 3-G 4-H 5-I 6-F 7-D 8-B