# Module 1: Computer hardware and software

1.1 Different types of hardware of a common system

After you have completed this module, you should be able to :

* Identify the components of the system unit
* Explain the term CPU and its purpose
* Describe the term CPU and explain the impact of using various different types of CPU’s
* Describe different types of CPUs with regard to use, and power
* Define the term computer memory
* Discuss the primary purpose of memory
* Differentiate between different types of memory and their purpose (Range: RAM, ROM, CMOS, Cache memory, Flash Memory)
* Explain how data is stored on memory
* Define the purpose of the motherboard and its components
* Describe different types of input hardware with regard to use and classification e.g. direct and indirect entry
* Discuss how data is transferred between memory i.e. primary and secondary and the CPU
* Describe the Flow/transfer of data between components. (Range: USB – PnP, U3, Point-to-point connections)
* Describe the factors to consider when choosing an input device. (Range: Ergonomic considerations, Wireless vs cables)
* Describe different types of output hardware
* Describe the purpose and use of devices such as docking stations for mobile and laptop computers.
* Describe the term software
* Describe the purpose and function of software
* Describe the basic concepts of software. (Range: Software as programs. Identify software components. Concept of a graphical user interface (GUI).)
* Contrast: System software vs application software
* Differentiate between: Shareware, Freeware, Open Source Software and Proprietary software, Firmware
* Discuss the process of how software is obtained and installed.
* Differentiate between online software and installed software.
* Discuss the following terms in relation to software. (Range: Compatibility issues, Versions, patches and service packs, Updating software)
* Launch a new Linux terminal on the Raspberry Pi
* Use the man command to get help
* Expand a Linux file path and explain each element
* List the contents of the current folder using the ls command
* Change directly location using the cd command
* Create a new folder using the mkdir command
* Remove a folder using the rmdir command
* Remove a file using the rm command
* Rename a file using the mv command
* Copy a file using the cp command
* Clear the command prompts screen using the cls command
* Run an executable file from the command line

# Activity 1.1 FORMATIVE ASSESSMENT

1.1.1 A system unit is the part of a computer that houses the primary devices that perform operations and produce results for complex calculations. ✓ ✓ (2)

1.1.2 The purpose of the CPU is to carry out the set of instructions given to the processor from a program. ✓ ✓ (2)

1.1.3 Information Processing Cycle Stages

1. Fetch- Instruction from Memory (Instruction Fetch, IF) ✓
2. Decode the instructions into binary (Instruction Decode, ID) ✓
3. Execute action and move to next step or calculate address (EXE) ✓
4. Access memory operand (MEM)✓
5. Write back result to register (WB) ✓ (5)

1.1.4 The rate at which one operation is completed in a second is measured in **hertz**. ✓ (1)

1.1.5 THREE main components of the CPU.

* Control Unit✓
* Arithmetic Logic Unit✓
* Registers✓ (3)

1.1.6 Differences between RISC and CISC

* In RISC, the instruction set is reduced, and most of these instructions are very primitive, while in CISC, the instruction set is very large that can be used for complex operations. ✓
* RISC computer’s execution time is very less, whereas CISC computer’s execution time is very high. ✓
* In RISC, the decoding of instructions is simple, whereas, in CISC, the decoding of instructions is complex. ✓ (6)

1.1.7 FOUR functions of a computer

1. **Data processing-** Data can take many forms, and the processing requirements are numerous.
2. **Data storage-** Even if the computer is processing data on the fly, it must temporarily store at least those pieces of data that are currently being worked on.
3. **Data movement-** The operating environment of a computer is made up of devices that act as data sources or destinations.
4. **Control-** A control unit manages the computer's resources and orchestrates the performance of its functional parts in response to commands.

1.1.8 The memory hierarchy is an improvement of computer storage into a hierarchy-based modal on response time. ✓✓ (2)

1.1.9 Static Random Access Memory and Dynamic Random Access Memory. ✓✓ (2)

1.1.10 Secondary memory is computer memory that is non-volatile and persistent in nature and is not directly accessed by a computer/processor. ✓✓ (2)

1.1.11 Hardware Devices

|  |  |  |
| --- | --- | --- |
| **Input devices** | **Processing devices** | **Output Devices** |
| Mouse✓ | Motherboard✓ | Monitor/Screen✓ |
| Keyboard✓ | Arithmetic Logic Unit✓ | Printer✓ |
| Light pen✓ | Processor✓ | Plotter✓ |

**(8)**

**Total:42 Marks**

# Activity 1.2 FORMATIVE ASSESSMENT

1.2.1 Software – set of instructions, data or programs used to operate computers and execute specific tasks. ✓✓ (2)

1.2.2 THREE types of language translators (3)

Translators✓

Compilers✓

Assemblers✓

1.2.3 Compiler-A compiler is a computer program that transforms whole code written in a high-level programming language at once into the machine code✓✓ whereas an interpreter is a computer program, which converts each high-level program statement into the machine code line by line. ✓✓ (4)

1.2.4

**Freeware-** Freeware is the software that is available to use for free of cost without any limitations. ✓✓

**Middleware**- is software that is used to bridge the gap between applications and other tools or databases. Some examples of middleware activities include handling data and [API](https://www.techtarget.com/searchapparchitecture/definition/application-program-interface-API) management, authentication and messaging services. ✓✓

**Shareware**- The software is copyrighted and distributed for free only for testing purposes. After the trial period ends, you must pay. ✓✓

**Open source-** This is provided for use, modification, and redistribution. Open-source software is downloaded from the internet at no cost. ✓✓

(8)

1.2.5 **FOUR** categories of system software.

* Operating System✓
* Device Driver✓
* Language Translator✓
* Utility Programs✓

1.2.6 Benefits of online software

1. No software to install- Software is installed from the cloud. Once users have a license, it is easy to install. In addition, you can always retrieve the licence if lost. ✓✓
2. Complete flexibility on device type-Users do not need to be very careful with regards to storing the software. ✓✓
3. No maintenance required. - The responsibility is taken care of by the providers of the software or those who manage the cloud storage. ✓✓
4. Connect from anywhere at any time with internet- users can install the software from any geographical location and any time of the day. ✓✓
5. Centralised storage offering safe and secure data✓✓ (10)

1.2.7 Compatibility is the capacity for two systems to work together without having to be altered to do so. ✓✓ (2)

**Total:29 Marks**

# Activity 1.3 FORMATIVE ASSESSMENT

1.3.1 To launch Linux terminal on Raspberry Pi, you need to do the following steps:

Step 1: From the Raspberry Pi icon✓, select Accessories✓

Step 2: From the Accessories, click terminal✓ (3)

1.3.2 ls- is used to list all files and directories in a file path on the Raspberry terminal. (1)

1.3.3 Raspberry Pi terminal commands

pi@raspberrypi:~/$cd Desktop✓

pi@raspberrypi:~Desktop $ mkdir terminal\_commands✓

pi@raspberrypi:~/Desktop $ cd terminal\_commands✓

pi@raspberrypi:~/Desktop/terminal\_commands $ pwd✓✓

/home/pi/Desktop/terminal\_commands

pi@raspberrypi:~/Desktop/terminal\_commands $

pi@raspberrypi:~/Desktop/terminal\_commands $ touch summative.docx✓

(6)

1.3.4 Adding text into the file called summative.docx

pi@raspberrypi:~/Desktop/terminal\_commands $echo “Hello fellow programmers”>> summative.docx✓✓✓

(3)

1.3.5 Merging contents of files.

pi@raspberrypi:~/Desktop/terminal\_commands $

pi@raspberrypi:~/Desktop/terminal\_commands$touch formative.docx

$ echo "Terminal commands are areasy">>formative.docx

$ cat formative.docx summative.docx >> final.docx

$ tac final.docx

(8)

1.3.6 Pairing the commands to the use

|  |  |
| --- | --- |
| **Command** | **Function** |
| rm | This command is used to delete files within a directory. |
| rmdir | To permanently delete an empty directory. |
| man | Is used to know more about a command and how to use it |
| mkdir | Used to create a new directory |

**(4)**

**Total: 25 Marks**

# Activity 1.4 SUMMATIVE ASSESSMENT

1.4.1 The difference is that a Memory buffer register (MBR) contains a word to be stored in memory or sent to the I/O unit or is used to receive a word from memory or from the I/O unit. ✓✓whereas Memory address register (MAR) specifies the address in memory of the word to be written from or read into the MBR. ✓✓ (4)

1.4.2SRAM: is a memory chip that is faster and uses less power than DRAM✓✓.whereas DRAM is a memory chip that can hold more data than an SRAM chip, but it requires more power. ✓✓ (4)

1.4.3 FIVE factors to consider when choosing an input device.

1. **User Needs**- this is the urgency of use of the device in the computer room by users also whether it will satisfy the needs of the user. ✓✓
2. **Initial cost-**the amount it can cost when buying/purchasing the devices✓✓
3. **Maintenance Cost**-the amount that can be used to maintain the servicing of these devises should be considered. ✓✓
4. **Mode Of Transmission**- how will you transport them to the computer room should be considered✓✓
5. **Compatibility With Available Hardware**- will the devices fit to other devices in the room already. A device that fits your needs but doesn't work with your computer is useless. ✓✓
6. **User- Friendliness**- whether the devices will be used to solve problems and easy to be used by users✓✓ (10)

1.4.4 Types of ROM

1. **MROM (Masked Read Only Memory)** ✓
2. **PROM (Programmable Read Only Memory)** ✓
3. **EPROM (Erasable and Programmable Read Only Memory)** ✓
4. **EEPROM (Electrically Erasable and Programmable Read Only Memory)** ✓

**(4)**

**1.4.5 Differences between microcontroller and microprocessor**

1. **Microprocessors only have a Central Processing Unit, whereas Micro Controllers have a CPU, Memory, and I/O all integrated into a single chip.** ✓✓
2. **Microprocessors are used mainly in personal computers, whereas microcontrollers are used in embedded systems.** ✓✓
3. **Microprocessors are based on the Von Neumann model while microcontrollers are based on the Harvard architecture.** ✓✓ (6)

1.4.6 Proprietary software is computer software where the source codes are publicly not available only the company that has created can modify it. ✓✓ (2)

1.4.7 Forward compatibility is a design principle in which a program or piece of hardware is designed to work with new software or devices in the future. ✓ (1)

1.4.8 False (1)

1.4.9 The terminal will print the message in quotation marks and repeat the process id twice. Example: The process id is 590590✓✓ (2)

1.4.10 Working with terminal commands

pi@raspberrypi:~/$cd Desktop✓

pi@raspberrypi:~Desktop $ mkdir Practical✓

pi@raspberrypi:~/$cd Practical✓

pi@raspberrypi:~Desktop/Practical $ echo "It is the control unit that determines which machine instruction is to be executed next" >> next\_file.txt✓

pi@raspberrypi:~Desktop/Practical $ echo " The control unit is the brains of the computer " >> next\_file.txt✓

pi@raspberrypi:~Desktop/Practical $ pwd✓

(6)

**Total : 40 marks**

**Practical Activity: Software Installation**

Search for Anydesk and install the software on your machine. You can go to this link: <https://anydesk.com/en/downloads/thank-you?dv=win_exe>

Share the pin numbers of the software with your friend and try controlling each other’s machine.

The software allows remote control of one’s PC. This is quite helpful if you are working with a friend or classmate and he/she gets stuck but you are in a different geographical location. Also, if your friend or colleague is not able to follow the instructions, you can take full control of his or her computer and start assisting remotely.

# Module 2 Problem solving in computer programming