Question 1

    1. Graphical User Interface

    2. Command Line Interface

- 1. Touchscreen

2. keyboard.

- - Control of Memory
  Memory management is one of the three additional management functions that an OS does. is in charge of memory management, a crucial task that entails assigning and releasing Random Access Memory. The Central Processing Unit can quickly access storage that is located in the main memory. It consists of discretely addressed bytes. Two crucial components of memory management are keeping an eye on the memory addresses that user programs use and managing the amount of memory that is allotted to processes.
- File Management.

File management deals with adding, editing, removing and reading files. These files are arranged in a hierarchical structure by being grouped into directories. The OS controls file access for several user, maintains data integrity, and handles file permissions. It abstracts away the complexity of storage devices and file systems.

- Process Management

The OS coordinates the execution of user programs. It schedules process to run on the Central Processing Unit, ensuring fair utilization of resources. Process management includes creating, terminating, and suspending processes. The OS monitors processes to prevent errors, allocate Central Processing Unit time fairly and maintain system stability.

Question 2

- Two utility programs that might be used to deal with hard disk problems.
  1. Disk Defragmenter
  2. Disk Check(SanDisk)
- Disk Defragment
  Why it might be needed.

As files are created, modified, and deleted on a hard disk, they can become fragmented. It is therefore needed to recognise fragmented data on hard disk.

What it does

Disk Defragmenter rearranges the fragmented data on the hard disk so that each file is stored in contiguous sectors making it easier for the operating system to retrieve files and boosting overall system perform.

Disk check (SanDisk)

Why it is needed.

Hard disks can develop errors over time due to various factors such as power outages, improper shutdowns, or physical damage. These errors can manifest as bad sectors, file system corruption, or other issues that may cause data loss or system instability.

What it does

Disk check repair any issue after scanning the hard disk for errors. It can detect and fix problems with the file system, recover data from bad sectors by marking them as unusable, and ensure the overall integrity of the disk.

- Identify two other utility programs for a PC user.
- Screenshot Tool: While some operating systems have basic screenshot functionality, specialist screenshot tools provide greater options and versatility. These tools enable you to record particular areas of the screen, make annotations or modifications, and quickly save or share the photographs.

  Password Manager: With the growing number of online accounts and the requirement of strong, unique passwords, password managers can be an extremely useful tool. These programmes securely save your login information for a variety of websites

- Library programs are made available for programmers.

–Explain why a programmer should use library programs
- Libraries provide many benefits to programmers. These pre-written and checked code blocks save you time and effort by eliminating the need to write everything yourself. Libraries are also trustworthy because they are designed by experts and regularly updated. This allows you to concentrate on the unique elements of your programme while also keeping up with industry changes. In summary, libraries enable programmers to work more efficiently and effectively.

- –Identify two examples of a library program
  1.React (JavaScript)
  2.NumPy (Python)

Question 3

Assemblers, compilers and interpreters are examples of translation programs.

–State the difference between an assembler and a compiler or interpreter
Assembler: Handles assembly language, a low-level language that is similar to machine code but provides some readability using mnemonics. It is specific to a particular CPU architecture. Compiler/Interpreter: Work with high-level languages (such as C++, Java, and Python) that are intended to be human-readable and run on a variety of computer platforms, resulting in increased portability.

–A 'two-pass' assembler is usually used. Give two examples of what might be done in the first pass
1.Symbol Table Creation and Address Assignment:

The assembler analyses the entire code, identifying all symbols (labels, variables, and functions) used in the programme.

It generates a symbol table, which is a data structure that maintains the name of each symbol together with its memory address.

The assembler may be unable to assign final memory locations to all symbols during the first pass. However, it can either reserve memory places or mark them as "to be determined.

Error checking (both syntax and semantic):

The assembler conducts basic tests to ensure that the code follows the assembly language's syntactic requirements. This includes verifying proper instruction forms, valid opcodes (operation codes), and correct operand usage.
Semantic checks can also be performed at the first run to detect any issues that would not be obvious from syntax alone. For example, the assembler may look for instructions referencing undefined symbols (labels that were used before being created) or attempts to access memory outside of valid boundaries.

- State what will be produced in the second pass
Second pass:
Using the symbol table from the previous pass, the assembler may generate machine code for each assembly instruction.

It resolves label references using the symbol table, which replaces symbolic names with memory addresses.
The second pass produces an executable machine code programme that the CPU can understand and execute.

•A programmer can choose to use an interpreter or a compiler.
–State three differences between how an interpreter works and how a compiler works

Interpreter: Line-by-line interpretation. The interpreter reads the source code line by line, transforms it into machine code on the fly, and executes it right away. This enables for shorter development cycles because you can see the results as each line is interpreted. However, it can be slower overall because the same code must be translated and executed multiple times.

Compiler: One-time Translation. The compiler processes the entire programme at once. It optimises the programme, creates machine code, and then executes the code.

–Discuss the advantages and disadvantages of an interpreter compared to a compiler

Faster Development Cycles: Interpreters enable a faster development workflow. Code is translated and executed line by line, allowing programmers to observe results and make changes quickly. This is perfect for prototyping, scripting, and interactive development, which require immediate input.
Greater Portability: Interpreted code is typically more portable. The source code is platform-independent, and as long as an interpreter is available for the target system, the same code can execute on a variety of hardware platforms. The interpreter handles the translation to CPU-specific machine code.