**Video Task**

**Video 1**

It focuses on the invention of the abacus, which was considered a computation device with beads for calculating numbers. As suggested by its founder, Asterolabe, human needs were becoming tremendously big and required a tool to store the results of calculations, similar to our current hardware. The functionality of the abacus can also be considered as a "Stack," as the data is stored in a Last-In-First-Out (LIFO) order. The term "computation" was invented in 1613 by Richard Braithwat.

If we examine the word "computing," it refers to computation and resonates with the inception of computer science, as it focuses on solving problems through computation and writing solutions, namely algorithms. Later, Steph Rockner was invented, which was used to add and subtract numbers. However, it was quite slow, and due to its time efficiency issues, the military invented the range table, which focused on finding ranges to calculate attacks.

During this time, Charles Babbage emerged with a new machine that could solve logarithmic and trigonometric equations. This machine gained a lot of popularity, and I believe that at that time, some auxiliary structures were used to invent the "for loop," which calculated the range and limit of an equation. Additionally, Charles also proposed the idea of an analytical machine, which focused on sequence structures so that instructions could be executed in a particular order. It also had the functionality of handling data, allowing algorithms to solve problems and print the results. However, this concept was not fully implemented yet, it introduced the concept of "synchronous computing" - performing multiple tasks simultaneously. This concept was embraced by Ada Lovelace, who is known as the world's first computer programmer.

**Video 2**

The development of computing technology has been marked by significant milestones and innovations. One such milestone was the Harvard Mark I, an early electromechanical computer developed during the 1930s and 1940s. The Harvard Mark I, also known as the IBM Automatic Sequence Controlled Calculator (ASCC), utilized electromechanical relays as a crucial component for its functionality.

The extensive use of electromechanical relays in the Harvard Mark I enabled it to perform a wide range of calculations, including complex mathematical operations. These relays acted as switches, controlling the flow of electricity and executing instructions. Thousands of relays were employed to store and process data, allowing the computer to carry out logical and arithmetic operations. Although the Harvard Mark I was a significant achievement for its time, its reliance on electromechanical relays made it slower compared to later electronic computers. Nevertheless, the use of relays in the Harvard Mark I laid the groundwork for the development of more advanced computing technologies and architectures that would follow.

In parallel with the use of relays, the advent of thyristor vacuum tubes, known as thyratrons, also played a significant role in early computer systems. Thyratrons served as rapid switches and amplifiers for controlling electrical signals in early electronic computers. Their ability to switch between on and off states made them invaluable for performing logical operations and controlling signal flow.

The mid-1940s to 1950s pertained the use of thyratrons in various early computer systems, including the ENIAC. These vacuum tubes powered the computational capabilities of these machines, enabling them to perform complex calculations and process data. Additionally, the contributions of Grace Hopper further revolutionized the field of computing. Grace Hopper played a crucial role in the development of COBOL (Common Business-Oriented Language), a programming language used with UGS. COBOL aimed to make programming more accessible to non-technical users, contributing to the growth and widespread use of computers in business applications.

**Video 3**

The computers are decision making machines which focuses on pertaining some signal to execute action. That action is represented by bits as computers don’t understand high level language they understand, binary which is represented by 2 states, 1 and 0. 1 means “On” and “0” means “Off”. Later, the concept of logic gates is discussed such as OR, AND, XOR, NOT. It is related to digital logic decision and aids in developing decisions on which computer acts. The behavior of these gates seems abstract yet it focuses on arithmetic such as 1\*1 =1 (decision).

**Video 4**

This video focuses on representing letters through binary. The ASCI standard was invented which is a 7-bit system that can attain range of 128 bytes. To avoid any anomaly and invent a standard, ASCII was invented that matches the hexadecimal value of any number, namespace or commas and display it as computer does not know what is “A”, it contains the binary value of 11001 which is a hex-decimal of 65. However, later Unicode was invented as computers were becoming more widely used and languages such as URDU, Persian and German needed interpretation, therefore, Unicode standard was invented, so was the datatype such as wchar.

**Video 5**

The Arithmetic Logic Unit , which is a crucial component of a computer's CPU. The ALU is responsible for performing arithmetic and logical operations, and it plays a fundamental role in how computers calculate and process data.

In the video, the ALU operates on binary numbers, which are represented using only two digits: 0 and 1. It can carry out various operations, including addition, subtraction, multiplication, division, comparisons, and bitwise operations.

The ALU receives inputs in binary format and uses circuits and algorithms to execute the requested operation. It generates outputs based on the inputs and the specific operation being performed. These outputs can then be stored in registers or transferred to other parts of the computer system.

The video highlighted the significance of the ALU in computer systems and how it enables computers to calculate, process data, and perform various operations. It gave me a deeper understanding of the essential role that the ALU plays in the computational capabilities of modern computers.

**Video 6**

The CPU (Central Processing Unit) is the "brain" of a computer, as it carries out the majority of calculations and instructions. It is responsible for executing program instructions, performing arithmetic and logical operations, and coordinating the activities of other hardware components. One important aspect of CPU performance is its clock speed. The clock speed measures the number of cycles the CPU can execute per second, typically measured in gigahertz (GHz). Each cycle represents a single instruction or operation. A higher clock speed means the CPU can perform more instructions in a given amount of time, resulting in faster processing. However, CPU always requires scheduling and have memory pools which focuses on allocating memory to the users.

Different scheduling algorithms such as EDF, rate monotonic and First-Come-First Served is written that allocate programs memory based on their requirement and priority. The deadlines are also missed to minimize the deadline.

**Video 7**

The video focuses on the basics of programming such as loops and sequential structures. The video discusses the role of GO-TO statements and represents why it is demonized as its debugging and execution chart becomes quite difficult. The video also discusses variables, and loops as they are used for repetition of some statement. It also focuses on conditional loops. However, what video lacked was the penalization of using for loop if we don’t know how long will the loop runs.

**Video 8**

Advanced CPUs have undergone significant advancements, offering features such as multi-core architecture, vector processing, out-of-order execution, superscalar design, cache hierarchy, simultaneous multithreading, and advanced instruction sets. Multi-core CPUs enable parallel processing, while vector processing handles data-intensive tasks. Out-of-order execution rearranges instructions for better efficiency, and superscalar architecture executes multiple instructions per cycle. Cache hierarchies reduce memory access latency, and simultaneous multithreading improves multitasking. Advanced instruction sets optimize processing, especially for multimedia and scientific applications. These features collectively enhance computational speed and efficiency, driving innovation in areas like AI and big data processing. Advanced CPUs shape the future of computing technology by handling complex workloads and enabling high-performance computing.

**Video 9**

This video focuses on instructions execution and how the higher language is converted into lower level through compiler and then assembler. It focuses on opcodes of different instructions and then explain the concept of multi core systems through Gantt charts. The concept of parallelism is also discussed that different tasks can be run as some can be waiting in the state while others are in ready queue.

**Video 10**

Advanced CPU design concepts focus on enhancing performance, efficiency, and functionality. These concepts include parallel processing, where multiple cores or threads execute tasks simultaneously, enabling faster computation. Instruction pipelining divides instruction execution into stages, allowing for a continuous flow of instructions. Cache memory hierarchies reduce memory latency by storing frequently accessed data. Branch prediction minimizes pipeline stalls caused by conditional branch instructions. Advanced CPU designs also incorporate out-of-order execution, allowing instructions to be executed in an optimized sequence for better resource utilization. Additionally, speculative execution predicts and performs computations ahead of time to further improve performance. These concepts collectively contribute to more powerful and efficient CPUs, enabling high-performance computing and improved user experiences.

**Video 11**

Early programming methods and technologies played a crucial role in the development of computer programming as we know it today. In the early days of computing, programming was vastly different from the high-level programming languages and integrated development environments we use today. One of the earliest programming methods involved the use of punch cards. These were physical cards with holes punched into specific positions to represent instructions or data. Programmers would create a sequence of these punch cards to define the steps of a program. The cards were then fed into a card reader, which would read the holes and execute the instructions accordingly. This method required meticulous attention to detail and careful arrangement of the punch cards to ensure the correct sequence.

Early programming also involved writing programs directly in machine code, which consists of binary instructions that the computer's processor can execute. This method required an intricate understanding of the computer's instruction set architecture and was highly error-prone. These early programming methods laid the foundation for modern programming practices. They introduced the concepts of sequencing instructions, defining data structures, and controlling hardware resources. Over time, higher-level programming languages were developed, providing abstraction and making programming more accessible to a broader range of users.

**Video 12**

The video focuses on the concept of basic programming and functions. The functional programming was a programming paradigm yet all languages use functions as a primitive way to act in any program. Functions are also really useful in recursion. In explicitly defined languages such as C++, the function’s data types also need to be defined. It also focuses on for loops and how they are used for repetitive execution of statements. However, the video lacks focus on exception handling as most exceptions are resulted through heap or the missed check in loop’s critical portion.

**Video 13**

In programming, statements and instructions are the building blocks of code that tell the computer what tasks to perform. A statement is a complete unit of code that expresses an action or command. It can be as simple as assigning a value to a variable or as complex as a loop or conditional statement. Instructions, on the other hand, are specific commands within a statement that carry out a particular action. They can include arithmetic operations, function calls, input/output operations, and more. Properly combining statements and instructions allows programmers to create sequences of actions, control program flow, and manipulate data, ultimately instructing the computer to perform desired tasks.

**Video 14**

Algorithms are basically some sequential statements that attain a particular task. The video discusses some popular sorting algorithms such as merge sort which focuses on sorting 2 arrays by merging them. However, she has not discussed any algorithms complexity which is a major issue as new algorithms such as selection sort were invented as they are greater in size. Later, graph algorithms are discussed which focuses on finding shortest path algorithms and how they assist in many flagships’ software such as Dijkstra in Google Maps.

**Video 15**

This video focuses on data structure and explain their role. Today, computing is not limited to only just some games yet it also involves businesses and structures like queue are critical for ticketing system or stack for keeping record of something or arrays that can be helpful in assigning tickets or selecting rows in front of screen in cinema. At large, it ensures that data structure play a key role in representing different built-in solutions to different problems.

**Video 16**

The Turing machine is a theoretical device that represents a simple model of a computer. It consists of an infinite tape divided into cells and a read/write head that can move along the tape. Each cell can hold a symbol, and the head can read and write symbols on the tape. The machine operates based on a set of rules that determine its behavior. Turing's work also played a vital role during World War II, where he worked at Bletchley Park, England, to decrypt coded messages created by the German Enigma machine. His contribution to code-breaking efforts was instrumental in shortening the war and saving countless lives.

Alan Turing's legacy is advancements in computing and artificial intelligence. He is one of the greatest pioneers in computer science.

**Video 17**

Software engineering focuses on the lifecycle of the software product. The projects start with a scope creep that focuses on some statement problem, later the definition expands into a solution. There are different models of software engineering such as waterfall model. The video relatively focuses on understanding use cases and how they evolve into a design. The concept of documentation is also mentioned so that the functions are documented along its importance.

**Video 18**

An integrated circuit is a miniaturized electronic circuit that incorporates various components, such as transistors, resistors, and capacitors, on a single chip of semiconductor material, typically silicon. ICs revolutionized the electronics industry by enabling the creation of compact, powerful, and reliable electronic devices.

Moore's Law, named after Gordon Moore, co-founder of Intel, states that the number of transistors on integrated circuits doubles approximately every two years. This observation, made in 1965, has held true for several decades, driving the rapid advancement of technology. Moore's Law has been a guiding principle for the semiconductor industry, pushing the limits of miniaturization and driving continuous improvements in computing power, efficiency, and the development of increasingly sophisticated electronic devices.

**Video 19**

The operating systems are also a critical part of computer as a computer requires a program to run a certain system. The first process that runs on a computer is operating system’s kernel that focuses on the communication between data and user’s tasks. The processes scheduling algorithms ensure that the resources of the computer are allocated effectively. It also contains drivers and different built-in software. OS are of 2 types such as Unix and dos. However, Linux is a very popular open-source system.

**Video 20**

Memory and storage are vital components of computer systems, responsible for storing and retrieving data. Efficient scheduling and memory algorithms play a crucial role in optimizing memory and storage utilization. Memory management algorithms, like paging and segmentation, organize and map processes' logical memory to physical addresses. Paging divides memory into fixed-size blocks, while segmentation divides it based on program structure. These algorithms optimize memory access, allocation, and deallocation.

Storage algorithms focus on efficient data storage and retrieval. Caching techniques temporarily store frequently accessed data in a faster cache memory to reduce access latency. Disk scheduling algorithms, such as First-Come, First-Served or Shortest Seek Time First , minimize disk head movement to optimize read/write operations. By using these scheduling and memory algorithms, computer systems can maximize memory and storage efficiency, improving overall performance and responsiveness.

**Video 21**

File serves as a fundamental unit for organizing and managing information. In programming, they play a crucial role in data storage, retrieval, and manipulation. File systems provide a hierarchical structure for organizing and managing files on storage devices. They handle tasks like file allocation, naming, and directory management.

Programming languages offer libraries and APIs for file system operations, enabling developers to create, open, close, read, write, and manipulate files programmatically. Programming with files involves tasks like parsing and processing data from text files, serializing and deserializing objects to and from binary files, and working with file metadata such as permissions and timestamps. Efficient file handling, error handling, and resource management are essential aspects of file programming to ensure data integrity and optimal performance.

**Video 22**

Compression is a technique used to reduce the size of data files, making them easier to store and transmit. Run-length coding is a simple form of compression that replaces repeated sequences of data with a count and a symbol. For example, instead of storing "AAAAA”, run-length coding represents it as 5A. This method is effective when data contains long runs of repeated symbols. Run-length coding is straightforward and efficient, but it may not be suitable for compressing data with less repetition. Other compression algorithms, such as Huffman coding and Lempel-Ziv-Welch compression, offer more advanced techniques for achieving higher compression ratios by leveraging statistical patterns in the data.

**Video 23**

Keyboards are input devices used to enter data into a computer system. They consist of a set of keys representing alphanumeric characters, symbols, and special function keys. Command line interfaces (CLIs) are text-based interfaces where users interact with a computer by typing commands. ASCII (American Standard Code for Information Interchange) tables define a standard encoding scheme for representing characters as numeric values. In Linux, the keyboard interacts with the system through interrupts. When a key is pressed, an interrupt signal is generated, prompting the operating system to handle the input. CLIs in Linux, such as the Bash shell, provide a powerful and flexible way to execute commands, automate tasks, and manage the system efficiently.

**Video 24**

2D graphics refer to the creation, manipulation, and rendering of two-dimensional visual elements on a computer screen or other display devices. Unlike 3D graphics that simulate depth and three-dimensional objects, 2D graphics focus on flat shapes, lines, colors, and textures. Programming for 2D graphics involves techniques such as coordinate systems, drawing primitives (points, lines, and polygons), color manipulation, and texture mapping. Displaying 2D graphics on screens involves technologies like LCD or LED screens, which utilize a grid of pixels to display images. Each pixel represents a single point of color, and by controlling the color of individual pixels, 2D graphics can be displayed and animated on screens, enabling a wide range of applications from digital art to user interfaces.

**Video 25**

During the cold war, the American nation was at war with the different super powers in the world. The US started the Manhattan project which resulted in funding of heavy projects in science and technology. It also resulted into the development of ENVIAC. There were 100 computers at that time in the world. However, Japanese created a radio that entered American markets which due to low price and advanced technology became a hit.

The American competitors resulted into a race with Japanese and invented their products as well. Due to the race, the economies of scale were achieved and then the excessive use of computer age started as demand increased tremendously.

**Video 26**

The personal computer revolution is inspired by micro systems network which resulted in cheap availability of computers. One engineer Steve Wozniak, developed a computer Apple 1 which was around $666, due to its affordability, Apple gain popularity all over the world. Later Apple 2 was launched. However, windows were also tremendously popular and later the emergence of Steve jobs.

**Video 27**

Graphical User interface opened the gateway to many users as computer was firstly adapted by hobbyist, scientists or engineers specifically computer scientists. WIMP interface and Sketchdek was first adapted by Nasa but it also made it easier for local users to adapt. It was invented by a Berkely Ph.D. that focused on augment reality. Therefore, the adaption resulted into a pivotal role for a lot of people and increased the emergence of technology.

**Video 28**

3D graphics technology has revolutionized the way we perceive and interact with digital content. It involves creating and rendering three-dimensional objects and environments using computer-generated imagery (CGI). In the realm of programming, several aspects contribute to the development of 3D graphics. At its core, 3D graphics programming involves manipulating geometric shapes, textures, lighting, and camera perspectives to create realistic or stylized visuals. Programming languages like OpenGL and DirectX provide APIs and libraries for rendering 3D graphics on a computer screen. These APIs offer functions and tools to handle transformations, shading, rasterization, and other essential operations.

Real-time 3D graphics programming, commonly used in video games and virtual reality applications, demands efficient algorithms and optimizations to render complex scenes at interactive frame rates. Techniques like level-of-detail management, occlusion culling, and spatial partitioning are employed to optimize rendering performance.

Furthermore, modern 3D graphics programming often involves utilizing graphics libraries and frameworks like Unity and Unreal Engine, which provide high-level abstractions and tools for developing complex 3D applications.

**Video 29**

The computer networks are critical for communicating between machines. The early designs of networks were focused on simple switches which resulted into a blockage. Therefore, different concepts such as mesh topologies were invented which allows multiple communication of packets from different machines. Therefore, mac address and ip address were created, to keep the unique identity of the machine intact.

**Video 30**

The internet is a global network of interconnected computers and devices that communicate and exchange data using a standardized set of protocols. At its core, the internet relies on the Internet Protocol (IP), which provides the addressing and routing mechanisms for data packets to travel between devices. The internet facilitates a wide range of services and applications, such as email, web browsing, online gaming, video streaming, and file sharing. These services are built upon additional protocols like Hypertext Transfer Protocol for web browsing, Simple Mail Transfer Protocol for email, and Transmission Control Protocol for reliable data transmission. The World Wide Web is a significant component of the internet, allowing users to navigate and access interconnected web pages and resources through hyperlinks.

**Video 31**

The World Wide Web is a system of interlinked hypertext documents and resources that are accessed over the internet. In technical terms, the WWW is built upon a set of technologies and protocols that enable the retrieval and display of web pages.

At its core, the WWW relies on the Hypertext Transfer Protocol for communication between web browsers and web servers. HTTP facilitates the exchange of hypertext documents, which are written in languages like HTML and styled using CSS. The WWW has revolutionized information sharing, e-commerce, and communication on a global scale. It has enabled the rapid dissemination of knowledge, the creation of online communities, and the development of sophisticated web-based applications.

**Video 32**

With the increasing traffic on the internet, the illegal use of net was also excessively advertised and pertained, which resulted into a catastrophe. Different tools were invented such as Anti-viruses or Virtual Networks such as VPNs to keep intranets safe from illicit users. The integrity of data is really effective and therefore, different mechanism is implemented including https for secure transmission of data between 2 entities.

**Video 33**

The hackers and cyber attacks is another problem with-in the internet. There are many things such as phishing or cyber attacks that target simple users and exploit them to attain access of certain data. There are many kinds of attacks such as SQL injection and Buffer Overflows or random memory access especially in C. The concept of malware and firmware is widely adapted which results in tremendous problems for many users. Therefore, to keep users safe, different technologies such as Avira or Linux are invented.

**Video 34**

Cryptographical techniques are used to convert the input into a cyphertext from of output that is hardly understand by any illicit users. The design of this technology is based on mathematical functions such as One-way functions, which are hard to reverse. The concept of cryptography was born when first during World War 1, German army used different cyphers to decode their message. Therefore, Americans invented their own models to compete with enigma machines.

Today, there are many algorithms that focuses on cryptography such as RSA, Advanced Encryption Standard. Decryption refers to converting the cyphertext back into the original information.

**Video 35**

Machine Learning and Artificial Intelligence are buzz words in today’s world that focuses on solving problems through decision trees. Decision trees are based on if statements that focuses on finding solutions to the problem based on some certain value. The data is trained through labelling and then certain values are stored and compare and depending the quadrant it lies; it is labelled as that set. Artificial Intelligence, then utilizes that train dataset to make predictions. It also uses reinforcement learning to learn from previous problems and issues.

**Video 36**

Natural Language Processing (NLP) is a branch of artificial intelligence (AI) that focuses on the interaction between computers and human language. It involves developing algorithms and models that enable computers to understand, interpret, and generate human language. NLP encompasses a range of tasks, including language translation, sentiment analysis, speech recognition, information extraction, and text generation. It utilizes techniques such as machine learning, deep learning, and linguistic rule-based approaches to process and analyze text and speech data. NLP has numerous applications, from chatbots and virtual assistants to automated language translation and sentiment analysis in social media. It continues to advance, aiming to bridge the gap between human language and computational systems.

**Video 37**

Computer vision is a field of artificial intelligence that focuses on enabling computers to understand and interpret visual information from images or videos. It involves developing algorithms and models that can extract meaningful insights from visual data, mimicking human visual perception. Computer vision tasks include object detection and recognition, image segmentation, facial recognition, image classification, and scene understanding. It utilizes techniques such as deep learning, convolutional neural networks (CNNs), and image processing algorithms to analyze and extract features from visual data. Computer vision has numerous applications, from self-driving cars and surveillance systems to medical imaging and augmented reality. It plays a critical role in enabling machines to perceive and comprehend the visual world around us.

**Video 38**

Robots are autonomous or semi-autonomous machines designed to perform tasks with varying degrees of complexity. They are built with mechanical components, sensors, and computational systems that enable them to interact with and manipulate their environment. Robots can be found in various domains, including manufacturing, healthcare, agriculture, exploration, and entertainment. They are programmed to execute specific actions or follow intelligent algorithms to complete assigned tasks. Advances in robotics have led to the development of humanoid robots that mimic human-like movements and interactions. Robots have the potential to improve efficiency, productivity, and safety in various industries, and their capabilities continue to expand with advancements in artificial intelligence and machine learning.

**Video 39**

The psychology aspect is also critical for computers as it assists users in adapting technology. The usability can be increased by using different colors and chunking the information so that readability can be increased. If you look at AI generated code, it contains different chunks which makes information easier to read. Icons and different affects are adapted to make sure that users can easily click or use any interface. There are also concepts of mutual gaze and augmented gaze which focuses on increasing human computer interaction.

**Video 40**

Educational technology includes use of computer systems and digital tools to enhance and support learning experiences in education. It encompasses a wide range of technologies, including computers, tablets, online learning platforms, educational software, and interactive multimedia. Moreover, Educational technology enables personalized and adaptive learning, facilitates access to educational resources and information, and promotes collaboration and engagement among students. Computer systems play a crucial role in educational technology by providing the infrastructure and hardware necessary to run educational software, access online resources, and facilitate communication and interaction between educators and learners. They empower educators to create interactive lessons, track student progress, and provide personalized feedback, revolutionizing the traditional classroom and opening new possibilities for education.

**Video 41**

The last video focuses on defining the concept of ubiquitous computing and the new age of AI that can be used to pertain new solutions. It was predicted that new AI systems would be readily available throughout systems. The singularity of human race would also emerge as now computers are becoming tremendously powerful which would lead to replacing the sense of human emotions. There are different perspectives around computing yet it can also result in to a unemployment and resulting cyborgs in daily life. However, that idea seems very alienating yet it is part of the discussion in modern computing.