

Information & Communication Technology 1

Introduction

- **ICT:** Information And Communication Technology
- Evolution of Technology and Computing
- Meanings, advantages, disadvantages, uses of information technology
- Number Systems (Binaries & Decimals)
- Basics of Internet
- Digital Initiatives in Higher Education
- Information Technology & Governance

I.C.T: Specifications & Effects

- Digital Transformation of the society
- Rapid interaction among people using advanced communication methods
- Newer dimensions to R&D: Data (record & storage), analysis and processing
- Multitasking
- Precision
- Learning facilities and Opportunities

INTRODUCTION TO COMPUTERS

- **Computer:** Fast and accurate electronic machine that converts data into meaningful information
- Used to perform calculations, documenting texts, editing photos & videos, accessing information online, educational requirements etc.
- Works with the help of a hardware and software
- **Hardware:** Physical components of a computer
- **Software:** Instructions & programs fed in a computer
- Evolution of computers through **five generations**

❖ First Generation

- **Time Period:** 1946 – 1959
- **Basic Components:** Vacuum tubes
- **Language:** Machine Language
- **Memory:** 4000 bits
- **Size:** Almost the size of a big room
- Examples: ENIAC, UNIVAC, IBM-701

Challenges:

- ✓ Vacuum tubes generated a lot of heat; decreased efficiency & reliability
- ✓ Supported machine language only
- ✓ Very costly; affordable only to large organizations

❖ Second Generation

- **Time Period:** 1959-1965
- **Basic Components:** Transistors
- **Language:** Assembly Language
- **Memory:** 32,000 bits (Primary + Secondary)
- **Primary Memory:** Used Magnetic cores
- **Secondary Memory:** Used Magnetic Tapes & Magnetic Disks
- **Size:** Comparatively smaller in size
- **Examples:** IBM 400, IBM 1600

Features:

- ✓ Relatively faster and reliable than vacuum tubes
- ✓ Less heat, less electricity required, much faster
- ✓ Supported Machine & Assembly Languages Still Very Costly

❖ Third Generation

- **Time Period:** 1965-1971
- **Basic Components:** Integrated Circuits (IC)

- **Language:** High Level; BASIC, PASCAL, FORTRAN, COBOL
- **Memory:** 1,28,000 bits
- **Size:** Relatively smaller than other two generations
- **Examples:** UNIVAC 9000, Personal Data Processor (PDP)

Features:

- ✓ Faster and Reliable; less maintenance and heating
- ✓ Lesser electricity required in comparison After all they were costly

❖ Fourth Generation

- **Time Period:** 1971-1980
- **Basic Components:** Large Scale Integrated Microprocessors(LSI) & Very Large Scale Integrated Microprocessors (VLSI)
- **Language:** High Level; C, C++, DBASE
- **Memory:** 100 billion bits
- **Size:** Portable if required; Micro computers
- **Examples:** Personal Computers

Features:

- ✓ Very cheaper in comparison
- ✓ Concept of Internet was introduced after this
- ✓ Easy availability of computers

❖ Fifth Generation

- **Time Period:** 1980s to present and beyond
- **Basic Components:** Ultra Large Scale Integrated Microprocessors(ULSI) & Artificial Intelligence (AI)
- **Language:** High level; SQL, Java, .net
- **Memory:** Beyond limits
- **Size:** Pocket sized and other gadgets
- **Examples:** Laptops, Smartphones, Robots etc.

Features:

- ✓ Robotics and Natural Language/Voice Recognitions
- ✓ User-friendly multimedia interfaces & parallel processing Availability at cheaper rates

Q & A

1. Which generation of computers used vacuum tubes as the basis of operation?

- First generation
- Second generation
- Third generation
- Fourth generation

Answer : a

2. What was the basis of second generation of computers?

- Microprocessors
- Integrated Circuits
- Transistors
- Vacuum tubes

Answer : c

3. Which generation of computers is equipped with artificial intelligence?

- Third generation
- Fourth generation
- Fifth generation
- Second generation

Answer : C

4. Machine Languages are

- High-level Languages
- Medium Languages
- Low-level Languages
- None of the above

Answer : C

5. Which among the following languages were used in second generation of computers?
- High-level Language
 - Machine Language
 - Assembly Language
 - Programming Language

Answer : C

6. IBM 1401 is a
- First Generation Computer
 - Second Generation Computer
 - Third Generation Computer
 - Fourth Generation Computer

Answer : b

ARTIFICIAL INTELLIGENCE

Introduction to Artificial Intelligence (AI)

- **Founding father:** Alan M. Turing (1912-1954), a British mathematician
- **Turing test:** A test proposed (1950) by the English mathematician Alan M. Turing to determine whether a computer can “think.”
 - A human questioner interrogates both a human subject and a computer. By means of a series of such tests, a computer’s success at “thinking” can be measured by its probability of being misidentified as the human subject.
 - Buzzfeed data scientist Max Woolf said that ChatGPT had passed the Turing test in December 2022

❖ ChatGPT

- **Chat Generative Pre-training Transformer**
- An open software that allows a user to ask it questions using conversational, or natural, language
- Released on **November 30, 2022**, by the American company **OpenAI**– refers itself as a language model

- Shocked the different spheres of academics & journalism with its impossibility to distinguish human writing from ChatGPT-generated writing.
- It’s designed to respond to prompts by generating text based on patterns and associations in the data

❖ BingChat

- An AI-powered chatbot **developed by Microsoft**.
- Provide users with conversational responses and up-to-date information.
- BingChat AI can answer questions, perform searches, and provide creative responses.
- Help users to find information, compare products, draw text art, convert date and time, and more.
- There may be limits on the number of chats per session or per day (max. 30 chats per day)
- Longer chat sessions may result in repetitive or less helpful responses.

❖ Google Bard

- An experimental conversational AI service developed by **Google**.
- Powered by the **LaMDA** (Language Model for Dialogue Applications)
- Designed to generate human-like text responses and engage in natural conversations with users.
- Offers advanced natural language processing capabilities, can be used for a variety of tasks, including content creation, translation, question answering, and more.
- Offers integration with various Google apps and services, such as Gmail, Drive, YouTube, Maps etc.
- May not always be creative or provide accurate responses to complex or factual subjects– learning algorithm is not yet able to remember previous conversations

Similar AI software list:

- **Character.AI:** Converse with an AI– more of a novelty service than a helpful tool– AI approximations of these figures– discuss science with Einstein or Twitter drama with Elon Musk
- **Socratic:** It will read questions using your camera, or you can ask it yourself using the voice assistant– it will tell you the answer– explain why that’s the answer too by providing links to answers from the web
- **DALL-E:** An AI model developed by OpenAI that generates images from text descriptions

Beneath advancements in AI-generated media, they also raise concerns about the reliability of communications in the future

Eg: ‘Deepfake’ shows manipulative synthetic media

TYPES OF COMPUTERS

Operation Based Classification

❖ Analog

- ✓ Process analogue data
- ✓ Data is continuous and not discrete
- ✓ Can process numeric data alone
- ✓ Better in terms of speed
- ✓ Examples: Aircraft computers & simulators, Speedometers etc.

❖ Digital

- ✓ Works on digital data
- ✓ Only discrete values like ‘0’ and ‘1’
- ✓ Both numeric and non-numeric data can be processed
- ✓ Better in terms of memory and accuracy

Examples: Personal Computers

HYBRID COMPUTERS: They are a combination of analogue and digital computers. They have high speed of analogue computers and the accuracy and memory of digital computers. They can process both continuous and discrete data

Example: Petrol Station Machines, Electrocardiogram and Ultrasound machines

Size Based Classification

- ✓ Supercomputers
- ✓ Mainframe Computers
- ✓ Mini Computers (Mid-range Computers)
- ✓ Micro Computers (Personal Computers)

❖ Supercomputers

- High performance computers for specific purposes
- Computational tasks like weather forecast, research and development programmes, earthquake studies etc.
- Performance is measured in terms of Floating-Point Operations per second (FLOPS); devices these days perform 1102 PFLOPS
- They are expensive and huge in size
- **Examples:** Satellite launching supercomputers in NASA, IBM Summit (2018, US), Dell Frontera (2019, US), Fujitsu Fugaku (2020, Japan), HP Frontier (2023, US)
- **First Supercomputer in India: PARAM 8000**
- **Latest Supercomputer: PRATYUSH & MIHIR** (Estd. @ Indian Inst.of Tropical Meteorology, Pune and National Centre for Medium Range Weather Forecast (NCMRWF), Noida respectively (As per Jan.2018, fastest in India)

❖ Mainframe Computers

- Used to record huge amount data (big-data processing)
- Supports multiple operating systems – often used as servers
- Special features- virtual memory, hardware swapping without disruption
- High stability and reliability enable these machines to run uninterrupted for very long periods of time (for decades)
- Fault-tolerant computing, support mixed workloads, assured integrity

- **Examples:** Servers for ATM transaction recording, student data in universities, patient records in hospitals etc.

❖ Mini Computers

- Also known as **mid-range computers**
- Used for scientific and engineering computations, business data processing, file-handling and data management (mid-size servers)
- A midsize multiprocessing computer; consists of two or more processors and can support 4 to 200 users at one time.
- Used in institutes and departments for tasks such as billing, accounting and inventory management
- **Example:** IBM S/36, systems more oriented for corporate intranets, computer-aided manufacturing (CAM)

❖ Workstations

- High-end, expensive computers that are made for more complex procedures and are intended for **one user at a time**
- Science, math and engineering calculations—useful for computer design and manufacturing
- Sometimes improperly named for marketing reasons
- Not usually sold in retail

Example: Apple Mac Pro

❖ Microcomputers

- They are also known as Personal Computers
- Well-known pocket friendly type of computers
- Different varieties available in the market varying in size and price
- General-purpose computers designed for individual use
- Consists of a microprocessor as a central processing unit (CPU), memory, storage area, input unit and output unit
- Mainly used as home computers, programming, gaming etc. – high end PCs can be used in small scale businesses and offices.

- **Examples:** Desktops, Laptops, Modern Smartphones and Tablets

Q & A

1. Which of the following statements is true?

- Minicomputer works faster than Microcomputer
- Microcomputer works faster than Minicomputer
- Speed of both the computers is the same
- None of the above

Answer : a

2. Which of the following statements are true?

- Supercomputers are the fastest and most powerful type of computer, while microcomputers are the smallest and least powerful.
- Supercomputers are typically used for scientific research and engineering, while microcomputers are typically used for personal and business use.
- Mainframes are larger and more powerful than minicomputers, while minicomputers are larger and more powerful than microcomputers.
- All of the above statements are true.

Answer : d

3. Which of the following is the fastest supercomputer in the world as of September 2023 statistics?

- Frontier
- Fugaku
- LUMI
- Leonardo

Answer : a

4. **Assertion (A):** Mainframe computers are more powerful than minicomputers.

Reason (R): Mainframe computers have more processors and more memory than minicomputers.

Choose the correct option:

- Both A and R are true, and R is the correct explanation for A.

- b) Both A and R are true, but R is not the correct explanation for A.
- c) A is true, but R is false.
- d) A is false, but R is true.

Answer : a

5. Which of the following AI chatbots is known for its ability to generate musical pieces apart from creative text formats, like poems, code, scripts, email, letters, etc.?
- a) ChatGPT
 - b) Google Bard
 - c) Bing AI
 - d) All of the above

Answer : b

6. Which of the following AI chatbots is still under development?
- a) ChatGPT
 - b) Google Bard
 - c) Bing AI
 - d) All of the above

Answer : d

7. Which of the following AI chatbots has access to the real-time internet?
- a) ChatGPT
 - b) Google Bard
 - c) Bing AI
 - d) All of the above

Answer : c

8. Which of the following statement regarding ICT is/are true?
- P:** ICT is an acronym that stands for Indian Classical Technology.
- Q:** Converging technologies that exemplify ICT include the merging of audio-visual, telephone and computer networks through a common cable system. **[July 2018]**
- a) Only P
 - b) Only Q
 - c) P & Q
 - d) Neither P nor Q

Answer : b