SUMMARY OF THE FIRST 6 TOPICS

SHADRACK IKOHA MAKANCHI

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Topic 1:

Introduction to IT and Computers

➢ Information technology refers to the use of technological tools to process and analyze raw data into meaningful information.

Roles of IT in Financial Engineering

1. Algorithmic trading systems.
2. Data analysis using tools such as Excel, Python, R, etc.
3. Risk assessment and simulations.
4. Automating trading and investment decisions.
5. Storing and managing financial data.
6. Running financial models.

Roles of IT in Society

Positive Impacts

✓ Connects people globally via social media, video calls and messaging, breaking down geographical barriers.

- ✓ Enhances patient care through telemedicine, electronic health records (EHRs), AI Diagnostics, and efficient management.
- ✓ Leads to economic growth; financial engineers design products that stabilize markets.
- ✓ Enhances access to education through online platforms.
- ✓ Enhances financial services, including mobile wallets.

Negative Impacts

- ✓ Cybersecurity risks, including fraud and hacking.
- ✓ The digital divide excludes people without access to IT.
- ✓ Job displacement due to automation and AI.

Basic Computer Terminologies

- ➢ **Computer**: A device that accepts raw data (input), processes and stores it, and outputs meaningful information.
- ➢ **Hardware**: Physical components like keyboard, mouse, monitor, CPU, and hard drive.

- ➢ **Software**: Programs and instructions that tell the computer what to do. ○ *System Software*: Controls hardware (e.g., OS).

    - ○ *Application Software*: Used for tasks (e.g., browsers, calculators).

- ➢ **Data**: Raw facts.

- ➢ **Information**: Processed and meaningful data.

- ➢ **Input Devices**: Keyboard, mouse, scanner, microphone.

- ➢ **Output Devices**: Monitor, printer, speakers.

- ➢ **Historic Devices**: Abacus, Napier's Bones.

Components of a Computer

- **CPU**: Executes instructions.
- **Memory (Primary)**: RAM and ROM.
- **Mass Storage (Secondary)**: Hard disks, SSDs, flash drives.
- **Input Devices**: Keyboard, mouse.
- **Output Devices**: Monitor, printer.

Types of Computers

- Personal Computer (PC)
- Workstation/Laptop
- Minicomputer
- Mainframe
- Supercomputer

High Performance Computing (HPC)

Using powerful computers to solve complex calculations quickly.

Cloud Computing

Accessing storage, software, and computing power over the Internet.
Examples: Google Drive, AWS.

Computing Applications in Financial Engineering

- ➢ Building and testing financial models
- ➢ Analysing market data
- ➢ Risk analysis
- ➢ Pricing derivatives
- ➢ Forecasting trends
- ➢ Algorithmic trading

Topic 2:

Fundamentals of Computer Operations

➢ A computer follows the **IPOS cycle**:

IPOS Cycle

Input → Processing → Output → Storage

1. *Input*

➢ Entering data using input devices.

2. *Processing*

➢ Manipulating data using the CPU.

- **ALU**: Performs calculations and logic.
- **CU**: Controls operations.

3. *Output*

➢ Displaying results using devices like monitors and printers.

4. *Storage*

➢ Saving information for future use.

- Primary: RAM, ROM
- Secondary: HDD, SSD

5. *Control*

➢ The control unit directs all operations.

6. *Communication*

➢ Sharing data via Wi-Fi, Bluetooth, Internet.

Topic 3:

Computer Hardware & Software

COMPUTER HARDWARE

1. Input Devices

➢ Keyboard, mouse, microphone, joystick, scanner.

2. Output Devices

➢ Monitor, projector, speakers, printer.

3. Processing Unit

- CPU
- CU

- ALU

4. Ports and Connectors

- USB
- HDMI
- Ethernet

5. Storage Devices

Primary: RAM, ROM;
Secondary: Hard disk, SSD, flash drive

Internal Hardware

➢ Motherboard, power supply, cooling system, and network card.

Computer Software

➢ Software refers to programs and operating systems.

Types of Software

1. System Software

OS, drivers, utilities.

2. Application Software

Browsers, MS Office, media players.

3. Programming Software

Compilers, interpreters, and IDEs.

Topic 4:

Data and Data Files

- **Data**: Raw facts.
- **Information**: Processed data.

Types of Data

- Qualitative (nominal, ordinal)
- Quantitative (discrete, continuous)
- Primary
- Secondary

- Structured

- Unstructured

Data Files

Examples: .docx, .xlsx, .csv, .jpg, .mp3

File Organization

- Sequential

- Random/Direct Access

Data Processing

➢ Sorting, filtering, aggregating.

Data Security

➢ Encryption, backups, passwords.

Data Representation

➢ Binary: bits, bytes, words.

Topic 5:

Disk Storage Fundamentals

Types of Disk Storage

- Magnetic (HDD)
- Solid State (SSD, flash) ● Optical (CD)

Components

Platters, heads, actuators, controllers, cylinders, tracks, sectors, and spindles.

Capacity Units

Bytes, KB, MB, GB, TB, PB.

Factors Affecting Capacity

Storage density, number of platters, and track and sector density.

Clusters

Groups of sectors are treated as one unit.

Flowcharts have been added where appropriate. Let me know if you want diagrams, colour-coded flowcharts, or a PDF version!

TOPIC 6:

NUMBER SYSTEM AND BASES

A number system is a way of representing number using a set of digits or symbols

Types of number systems

1. Decimal (**Base 10**)
   Most common number system, using digits 0-9.

2. Binary (**Base 2**)
Uses only two digits 0 and1.
This is the basis for computer programmingB

3. Octal (**Base8**)
Uses 8 digits 0-7

4. Hexadecimal (**Base 16**)
Uses 16 digits 0-9 and A-F (where A=10, ..., F=15)

USES OF NUMBER SYSTEMS

- Computer programming
- Networking
- Cryptography
- Data storage