OVERVIEW OF FUTURE TECHNOLOGY

Future Technology refers to new technologies that are currently under development or existing technologies that are continuously improving and expected to have a significant impact on society, business, education, healthcare, and daily life in the coming years.

These technologies are designed to make life easier, faster, smarter, and more efficient. They are expected to bring major changes in the way people live, work, communicate, and interact with machines.

Future technologies generally include:

- Internet of Things (IoT)
- Artificial Intelligence (AI)
- Robotics
- Cloud Computing
- Big Data
- Machine Learning
- Blockchain
- 5G Technology

Example

Smart homes where lights, fans, ACs, and security cameras can be controlled using a smartphone.

Exam Tip

Future Technology = Emerging Technology + Continuous Innovation

INTRODUCTION TO INTERNET OF THINGS (IoT)

The **Internet of Things (IoT)** is a network of physical devices connected to the Internet that can collect, exchange, and process data without direct human intervention.

IoT allows everyday objects to communicate with each other through sensors, software, and internet connectivity.

The main objective of IoT is to connect ordinary devices such as fans, refrigerators, televisions, vehicles, watches, and even toasters to the Internet so that they can operate intelligently.

Example

A smart AC automatically adjusts room temperature based on sensor readings.

Exam Tip

IoT = Internet + Physical Objects + Data Exchange

CHARACTERISTICS OF IoT

1. Connectivity

All devices are connected through the Internet.

Example

A smartwatch connected to a smartphone.

2. Intelligence

Devices can make decisions based on collected data.

Example

Smart lights automatically switch on when someone enters a room.

3. Automation

Many tasks are performed automatically without human involvement.

Example

Automatic irrigation systems in farms.

4. Real-Time Monitoring

IoT devices continuously monitor conditions and provide instant updates.

Example

Health monitoring devices tracking heart rate.

Exam Tip

IoT Devices are Smart, Connected, Automated, and Data-Driven.

COMPONENTS OF IoT

An IoT system mainly consists of four important components.

1. SENSORS

Sensors are devices that collect data from the surrounding environment and convert it into useful information.

They are the most important part of any IoT system because they gather real-time data.

Functions

- Measure temperature.
- Detect motion.
- Measure humidity.
- Capture images.
- Detect pressure and light.

Types of Sensors

- Temperature Sensor
- Motion Sensor
- Humidity Sensor
- Light Sensor
- Pressure Sensor

Example

A temperature sensor in a smart AC measures room temperature.

Exam Tip

Sensor = Data Collector

2. CONNECTIVITY

Connectivity enables IoT devices to transfer collected data to cloud servers or other devices through communication networks.

Without connectivity, IoT devices cannot exchange information.

Communication Technologies

- Wi-Fi
- Bluetooth
- Mobile Networks
- Satellite Networks
- WAN
- NFC

Example

A smartwatch sends health data to a smartphone through Bluetooth.

Exam Tip

Connectivity = Data Transmission

3. DATA PROCESSING

After data is collected and transmitted, software processes the data to generate meaningful information.

The processing may be simple or highly complex depending on the application.

Functions

- Analyze data.
- Identify patterns.
- Make decisions.
- Generate alerts.

Example

A smart camera identifies a person's face using computer vision.

Exam Tip

Data Processing = Raw Data → Useful Information

4. USER INTERFACE

The User Interface (UI) is the medium through which users interact with IoT systems and receive information.

The system may provide notifications, alerts, reports, or dashboards.

Functions

- Display information.
- Send alerts.
- Allow user control.
- Provide monitoring facilities.

Example

A smartphone application showing live CCTV footage.

Exam Tip

User Interface = Interaction Between User and Device

WORKING OF IoT

The working of IoT follows a simple sequence:

Step 1

Sensors collect data.

Step 2

Data is transmitted through communication networks.

Step 3

Cloud servers process the data.

Step 4

Results are displayed to users through applications or dashboards.

Example

Smart Watch → Bluetooth → Mobile App → User Notification

Exam Tip

Sensor → Connectivity → Processing → User Interface

This is one of the most important IoT examination questions.

APPLICATIONS OF IoT

1. SMART HOME

IoT enables remote control of home appliances.

Example

Controlling lights and AC through a smartphone.

Exam Tip

Smart Home is the most common IoT application.

2. SMART HEALTHCARE

Doctors can monitor patient health remotely.

Example

Smart fitness bands measuring heart rate.

Exam Tip

IoT in healthcare improves patient monitoring.

3. SMART AGRICULTURE

Sensors monitor soil moisture, temperature, and crop conditions.

Example

Automatic irrigation systems.

Exam Tip

IoT helps increase agricultural productivity.

4. SMART CITIES

IoT helps manage traffic, lighting, water supply, and waste management.

Example

Smart traffic signal systems.

Exam Tip

Smart City = Major IoT Application.

5. INDUSTRIAL AUTOMATION

Industries use IoT devices to monitor machines and improve production.

Example

Sensors detecting machine faults before breakdown.

Exam Tip

Industrial IoT is often called IIoT.

ADVANTAGES OF IoT

TECHNICAL OPTIMIZATION

IoT improves the efficiency and performance of devices and systems by providing real-time monitoring and automation.

Example

Smart machines automatically adjust settings for better performance.

Exam Tip

Technical Optimization = Better Performance

REDUCE WASTE

IoT provides accurate information that helps organizations utilize resources efficiently and reduce wastage.

Example

Smart irrigation systems supply only the required amount of water.

Exam Tip

IoT = Resource Optimization

IMPROVED CUSTOMER ENGAGEMENT

IoT helps organizations understand customer requirements and improve services.

Example

Smart devices providing personalized recommendations.

Exam Tip

Better Customer Experience = Improved Customer Engagement

IMPROVED DATA COLLECTION

IoT collects large amounts of real-time data automatically.

Traditional methods are often slow and limited.

Example

Smart meters automatically recording electricity consumption.

Exam Tip

IoT = Real-Time Data Collection

DISADVANTAGES OF IoT

SECURITY

Since IoT devices are connected to networks, they are vulnerable to cyber attacks and unauthorized access.

A single weak device can affect the entire network.

Example

Hackers gaining control of a smart camera.

Exam Tip

Security is the biggest challenge of IoT.

PRIVACY

IoT devices continuously collect personal information, which may create privacy concerns if not properly protected.

Example

Smart speakers recording user conversations.

Exam Tip

More Data Collection = More Privacy Risk

COMPLEXITY

Designing, developing, managing, and maintaining large IoT systems is difficult and requires specialized expertise.

Example

Managing thousands of connected sensors in a smart city.

Exam Tip

Large IoT Networks = High Complexity

QUICK REVISION TABLE

Component	Remember As
Sensor	Data Collector
Connectivity	Data Transfer
Data Processing	Data Analysis
User Interface	User Interaction

BIG DATA ANALYTICS

Big Data Analytics is the process of collecting, organizing, processing, and analyzing extremely large volumes of data to discover useful patterns, trends, relationships, and insights that help organizations make better decisions.

In today's digital world, enormous amounts of data are generated every second through social media, websites, mobile applications, banking transactions, online shopping, sensors, and business operations. Big Data Analytics helps transform this raw data into meaningful information.

Example

An online shopping company analyzes millions of customer purchases to recommend products that customers are likely to buy.

Exam Tip

Big Data Analytics = Large Data + Analysis + Better Decisions

WHY BIG DATA ANALYTICS IS IMPORTANT

Organizations use Big Data Analytics to:

- Improve decision-making.
- Understand customer behavior.
- Detect fraud.
- Predict future trends.
- Increase business efficiency.
- Reduce operational costs.

Example

Netflix analyzes viewing history to recommend movies and web series.

Exam Tip

Big Data helps in Prediction, Analysis, and Decision-Making.

CHARACTERISTICS OF BIG DATA ANALYTICS

The characteristics of Big Data are commonly known as the **3 Vs of Big Data**.

1. VARIETY

Variety refers to different types and formats of data collected from multiple sources.

Earlier, data was mainly stored in databases and spreadsheets. Today, data comes from various formats and sources.

Types of Data

Structured Data

Data stored in rows and columns.

Example

Bank customer database.

Semi-Structured Data

Data that does not completely follow a fixed structure.

Example

XML files and JSON files.

Unstructured Data

Data without a predefined format.

Example

Photos, videos, emails, audio files, and social media posts.

Sources of Variety

- Emails
- PDFs
- Images
- Videos
- Social Media
- Sensors
- Mobile Applications

Example

A company collects customer reviews from Facebook, emails, and websites.

Exam Tip

Variety = Different Types of Data

2. VELOCITY

Velocity refers to the speed at which data is generated, collected, processed, and analyzed.

Modern systems generate data continuously and often require real-time processing.

Sources of High Velocity Data

- Social Media Posts
- Online Transactions
- Stock Markets
- IoT Devices
- GPS Systems

Example

UPI transactions are processed instantly in real time.

Exam Tip

Velocity = Speed of Data Generation

3. VOLUME

Volume refers to the enormous quantity of data generated every day.

The amount of data produced worldwide is increasing rapidly due to smartphones, social media, cloud services, and IoT devices.

Data Measurement Units

- MB (Megabyte)
- GB (Gigabyte)
- TB (Terabyte)
- PB (Petabyte)
- EB (Exabyte)

Example

Facebook generates billions of posts, comments, and images daily.

Exam Tip

Volume = Amount of Data

MEMORY TRICK FOR BIG DATA

3 Vs of Big Data

VVV

- **V** = Variety
- **V** = Velocity
- **V** = Volume

Exam Tip

Variety = Type of Data
Velocity = Speed of Data
Volume = Amount of Data

APPLICATIONS OF BIG DATA ANALYTICS

GOVERNMENT

Governments use Big Data Analytics to improve public services, infrastructure management, and policy-making.

It helps authorities manage large populations more efficiently.

Uses

- Traffic management
- Crime prevention
- Public welfare programs
- Utility management
- Disaster management

Example

Traffic cameras collect data to reduce congestion in smart cities.

Exam Tip

Government + Big Data = Better Public Services

HEALTHCARE

Big Data Analytics is transforming healthcare by helping doctors and hospitals make better medical decisions.

It enables personalized treatment and predictive healthcare.

Uses

- Disease prediction
- Patient monitoring
- Personalized treatment
- Medical research
- Hospital management

Example

Doctors use patient history data to predict future health risks.

Exam Tip

Healthcare + Big Data = Better Patient Care

BANKING

Banks use Big Data Analytics to detect fraud, improve customer services, and manage financial risks.

Uses

- Fraud detection
- Credit risk assessment
- Customer behavior analysis
- Financial planning

Example

Banks detect unusual credit card transactions instantly.

Exam Tip

Banking + Big Data = Fraud Detection

MANUFACTURING

Manufacturing industries use Big Data Analytics to improve product quality and increase production efficiency.

Uses

- Quality control
- Predictive maintenance
- Production optimization
- Waste reduction

Example

Factory sensors predict machine failures before breakdowns occur.

Exam Tip

Manufacturing + Big Data = Better Quality + Less Waste

VIRTUAL REALITY (VR)

Virtual Reality (VR) is a computer-generated three-dimensional environment that allows users to experience and interact with a simulated world as if it were real.

VR creates an immersive experience by engaging mainly two human senses:

- Sight
- Sound

Users typically wear special devices such as VR headsets to enter the virtual environment.

Example

A user wearing a VR headset feels as if they are walking inside a virtual museum.

Exam Tip

VR = Artificial 3D Environment

FEATURES OF VIRTUAL REALITY

Immersive Experience

Users feel completely involved in the virtual environment.

Example

A virtual roller coaster ride feels real.

Three-Dimensional Environment

Objects appear with depth and realism.

Example

Viewing a virtual classroom in 3D.

Interactive Environment

Users can interact with virtual objects.

Example

Picking up virtual objects using VR controllers.

Computer-Generated World

The entire environment is created using software.

Example

Virtual game worlds.

Exam Tip

VR = 3D + Interactive + Immersive

APPLICATIONS OF VIRTUAL REALITY

IN GAMING

Gaming is one of the most popular applications of Virtual Reality.

VR gaming provides highly realistic and immersive experiences.

VR Gaming Devices

- PlayStation VR
- Kinect
- Wii Remote
- VR Headsets

Example

A player feels as if they are physically inside a racing game.

Exam Tip

Gaming is the most commonly asked VR application.

IN HEALTHCARE

Virtual Reality is increasingly used in medical training and treatment.

Healthcare professionals can practice procedures in virtual environments before performing them on real patients.

Uses

- Surgical training
- Medical education
- Therapy
- Rehabilitation

Example

Medical students practice virtual surgery.

Exam Tip

VR Healthcare = Risk-Free Training

IN EDUCATION

Virtual Reality improves learning by providing interactive and engaging educational experiences.

Students can explore concepts visually and practically.

Uses

- Virtual classrooms
- Science simulations
- Historical tours
- Interactive learning

Example

Students virtually explore the Solar System.

Exam Tip

VR Education = Learning by Experience

IN ENTERTAINMENT

Virtual Reality enhances entertainment experiences by creating immersive content.

Uses

- 3D movies
- Theme parks
- Virtual concerts
- Interactive storytelling

Example

Watching a 360-degree virtual movie.

Exam Tip

VR Entertainment = Immersive Experience

IN BUSINESS

Businesses use Virtual Reality for training, marketing, product demonstrations, and virtual tours.

Uses

- Employee training
- Product visualization
- Virtual meetings
- Business presentations

Example

A company provides a virtual office tour to new employees.

Exam Tip

VR Business = Training + Product Demonstration

BIG DATA Vs VIRTUAL REALITY

Feature	Big Data Analytics	Virtual Reality
Purpose	Analyze huge amounts of data	Create virtual environments
Main Focus	Data and decision-making	User experience
Output	Insights and predictions	Immersive simulation
Example	Fraud detection	VR gaming

QUICK REVISION TABLE

Topic	Remember As
Big Data Analytics	Analysis of huge data
Variety	Different data types
Velocity	Speed of data
Volume	Amount of data
Government	Traffic and crime management
Healthcare	Patient care
Banking	Fraud detection
Manufacturing	Quality improvement
Virtual Reality	Artificial 3D environment
Gaming	Immersive games
Healthcare (VR)	Surgical training
Education (VR)	Interactive learning
Entertainment (VR)	3D experiences
Business (VR)	Employee training

ARTIFICIAL INTELLIGENCE (AI)

Artificial Intelligence (AI) is a branch of Computer Science that focuses on creating

intelligent machines capable of performing tasks that normally require human intelligence.

These machines can learn, think, reason, solve problems, make decisions, understand language, and improve their performance based on experience.

AI aims to develop systems that can mimic human intelligence and perform tasks automatically with minimal human intervention.

Example

Google Assistant answers questions and performs tasks using Artificial Intelligence.

Exam Tip

AI = Machines Thinking and Learning Like Humans

KNOWLEDGE ENGINEERING

Knowledge Engineering is one of the most important areas of Artificial Intelligence.

It focuses on providing machines with information, facts, rules, relationships, and knowledge so that they can make intelligent decisions.

For AI systems to behave intelligently, they must understand:

- Objects
- Categories
- Properties
- Relationships
- Facts
- Rules

The more knowledge a machine possesses, the better its decision-making capability.

Example

A medical AI system stores information about diseases, symptoms, and treatments to assist doctors.

Exam Tip

Knowledge Engineering = Giving Knowledge to Machines

CHARACTERISTICS OF ARTIFICIAL INTELLIGENCE

Learning

AI systems can learn from data and experiences.

Example

Netflix recommends movies based on previous viewing history

Reasoning

AI can analyze information and make logical decisions.

Example

A navigation app suggests the fastest route.

Problem Solving

AI identifies solutions to complex problems.

Example

Chess-playing software defeating human players.

Decision Making

AI can choose the best action based on available information.

Example

Self-driving cars deciding when to stop or accelerate.

Exam Tip

AI = Learning + Reasoning + Problem Solving + Decision Making

TYPES OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence is commonly classified into two major categories.

1. WEAK AI

Weak AI is designed to perform a specific task or a limited set of tasks.

These systems operate within predefined boundaries and cannot perform tasks outside their programmed functionality.

Weak AI is also known as **Narrow AI**.

Characteristics

- Task-specific.
- Limited intelligence.
- Cannot think independently.
- Most AI applications today belong to this category.

Example

Amazon Alexa answering voice commands.

Other Examples

- Google Assistant
- Siri
- Chatbots
- Chess Programs

Exam Tip

Weak AI = One Task Only

2. STRONG AI

Strong AI refers to systems that possess intelligence comparable to humans and can perform multiple tasks requiring reasoning, understanding, and learning.

Such systems are capable of handling complex situations and adapting to new environments.

Strong AI is also known as **General AI**.

Characteristics

- Human-like intelligence.
- Can perform multiple tasks.
- Learns and adapts independently.
- More advanced and complex.

Example

A fully autonomous self-driving car making decisions in all road conditions.

Exam Tip

Strong AI = Human-Like Intelligence

DIFFERENCE BETWEEN WEAK AI AND STRONG AI

Feature	Weak AI	Strong AI
Intelligence	Limited	Human-like
Tasks	Specific	Multiple
Learning Ability	Restricted	Advanced
Example	Alexa	Self-driving Car

Exam Tip

Weak AI = Narrow AI
Strong AI = General AI

APPLICATIONS OF ARTIFICIAL INTELLIGENCE

IN BUSINESS

Businesses use AI to automate repetitive tasks and improve efficiency.

AI-powered systems help organizations reduce costs and increase productivity.

Uses

- Customer support
- Process automation
- Data analysis
- Marketing

Example

A chatbot automatically answers customer queries.

Exam Tip

Business + AI = AutomatioN

IN GAMING

AI has become a major component of modern video games.

It controls computer opponents and improves gaming experiences.

Uses

- Intelligent opponents

- Character behavior
- Game environment control

Example

Computer-controlled opponents in a chess game.

Exam Tip

Gaming is one of the earliest successful applications of AI.

IN HEALTHCARE

AI helps doctors diagnose diseases faster and more accurately.

Machine Learning algorithms analyze patient records and medical images to support medical decisions.

Uses

- Disease diagnosis
- Medical imaging
- Drug discovery
- Patient monitoring

Example

IBM's **IBM Watson** assisting doctors in medical diagnosis.

Exam Tip

Healthcare + AI = Better Diagnosis

IN BANKING

Banks use AI to improve customer service and detect fraud.

AI systems continuously monitor transactions and identify suspicious activities.

Uses

- Fraud detection
- Customer support
- Risk assessment
- Loan approval

Example

AI detects unusual credit card transactions instantly.

Exam Tip

Banking + AI = Fraud Detection

IN AUTONOMOUS VEHICLES

Autonomous vehicles use AI to understand their surroundings and make driving decisions.

These vehicles use cameras, sensors, GPS, and AI algorithms.

Functions

- Lane detection
- Obstacle detection
- Traffic sign recognition
- Automatic braking

Example

Self-driving cars navigating roads without human drivers.

Exam Tip

Autonomous Vehicle = AI + Sensors + Decision Making

BLOCKCHAIN TECHNOLOGY

Blockchain is a decentralized digital ledger technology used to record transactions securely across multiple computers.

It stores information in blocks that are linked together in a chain.

Each block contains transaction data and once recorded, the information cannot be easily altered.

Blockchain eliminates the need for a central authority and allows direct transactions between participants.

Example

Cryptocurrency transactions recorded on a blockchain network.

Exam Tip

Blockchain = Distributed Digital Ledger

FEATURES OF BLOCKCHAIN TECHNOLOGY

Decentralization

No single authority controls the entire network.

Example

Multiple computers maintain transaction records.

Transparency

All participants can view transaction records.

Example

Transaction history visible on a public blockchain.

Security

Transactions are encrypted and highly secure.

Example

Blockchain protects financial transactions from tampering.

Immutability

Once data is recorded, it cannot be changed easily.

Example

Past transaction records remain permanent.

Exam Tip

Blockchain = Decentralized + Transparent + Secure + Immutable

WORKING OF BLOCKCHAIN

Step 1

A transaction is initiated.

Step 2

The transaction is verified by network participants.

Step 3

The verified transaction is stored in a block.

Step 4

The block is added to the blockchain.

Step 5

The transaction becomes permanent.

Exam Tip

Transaction → Verification → Block → Blockchain

ADVANTAGES OF BLOCKCHAIN TECHNOLOGY

BETTER DEVICE COMMUNICATION

Blockchain enables smart devices to communicate securely and efficiently.

Example

Smart IoT devices sharing information securely.

Exam Tip

Blockchain improves device-to-device communication.

REMOVAL OF INTERMEDIARIES

Participants can interact directly without third-party involvement.

Example

Direct money transfer without intermediaries.

Exam Tip

Blockchain = No Middleman

DURABILITY AND RELIABILITY

Blockchain operates through a distributed network, reducing the chances of system failure.

Example

Data remains available even if some computers fail.

Exam Tip

Distributed Network = High Reliability

IMMUTABLE RECORDS

Stored data cannot be easily modified or deleted.

Example

Financial transaction history remains unchanged.

Exam Tip

Immutability = Cannot Be Altered

ACCOUNTABILITY

Every transaction is recorded and traceable.

Example

Complete history of asset ownership.

Exam Tip

Blockchain = High Accountability

CHALLENGES OF BLOCKCHAIN TECHNOLOGY

HIGH POWER CONSUMPTION

Transaction verification requires significant computational power and electricity.

Example

Cryptocurrency mining consumes large amounts of energy.

Exam Tip

Major Blockchain Problem = High Electricity Usage

SLOW TRANSACTION SPEED

Before adding a block, the distributed network must verify transactions, which may take time.

Example

Heavy network traffic causing slower transaction processing.

Exam Tip

More Verification = Slower Transactions

DIFFERENCE BETWEEN AI AND BLOCKCHAIN

Feature	Artificial Intelligence	Blockchain
Purpose	Make machines intelligent	Secure record keeping
Main Focus	Learning and decision-making	Transaction security
Technology Type	Intelligent systems	Distributed ledger
Example	Chatbots, Self-driving Cars	Cryptocurrency

3D PRINTING / ADDITIVE MANUFACTURING

3D Printing, also known as **Additive Manufacturing**, is a manufacturing process in which a three-dimensional object is created by adding material layer by layer according to a digital design.

Unlike traditional manufacturing methods that remove material by cutting, drilling, or shaping, 3D printing builds an object by continuously adding material until the final product is completed.

The technology uses Computer-Aided Design (CAD) software or 3D scanners to create a digital model, which is then converted into a physical object by a 3D printer.

Example

A 3D printer creates a plastic toy by depositing material layer by layer.

Exam Tip

3D Printing = Additive Manufacturing = Layer-by-Layer ManufacturinG

FEATURES OF 3D PRINTING

Layer-by-Layer Construction

Objects are created one layer at a time.

Example

A plastic model is built gradually from bottom to top.

Digital Design Based

Requires a digital model before printing.

Example

A CAD drawing of a mobile stand.

High Precision

Produces highly accurate and detailed objects.

Example

Dental implants created with precise measurements.

Reduced Material Waste

Only the required material is used.

Example

No excess material is removed during production.

Exam Tip

3D Printing = Digital Design + Layer Addition

HOW DOES 3D PRINTING WORK?

The creation of a 3D object involves several steps.

STEP 1: CREATE A 3D MODEL

The object is designed using CAD software or 3D design software.

Example

Designing a keychain using CAD software.

Exam Tip

First Step = Create Digital Model

STEP 2: CONVERT TO STL FILE

The design is converted into an STL (Standard Tessellation Language) file.

STL is the standard format used by most 3D printers.

Example

Saving a CAD design as an STL file.

Exam Tip

STL = Standard Tessellation Language

STEP 3: TRANSFER FILE TO PRINTER

The STL file is transferred to the computer connected to the 3D printer.

Printing settings such as size and orientation are selected.

Example

Sending a toy model file to a 3D printer.

Exam Tip

Transfer STL File Before Printing

STEP 4: PREPARE THE PRINTER

The printer is prepared by loading the required printing material.

Example

Loading plastic filament into the printer.

Exam Tip

Printer Setup Before Printing

STEP 5: BUILDING PROCESS

The printer starts creating the object layer by layer.

Depending on the size and complexity, printing may take several hours or even days.

Example

Printing a helmet prototype.

Exam Tip

Most Time-Consuming Stage = Printing Process

STEP 6: REMOVE THE OBJECT

After printing is completed, the object is carefully removed from the printer.

Example

Removing a printed mobile holder.

Exam Tip

Handle Carefully—Object May Be Hot

STEP 7: POST-PROCESSING

Additional finishing operations may be performed.

Example

Cleaning and polishing a printed model.

Exam Tip

Final Step = Post-Processing

APPLICATIONS OF 3D PRINTING

ARCHITECTURAL MODELS

Architects use 3D printing to create building prototypes and scale models.

Example

Miniature models of houses and skyscrapers.

Exam Tip

Architecture = Scale Models

EYEWEAR

Manufacturers produce customized eyeglass frames using 3D printing.

Example

Customized spectacles.

Exam Tip

3D Printing Enables Customization

DENTAL PRODUCTS

Dentists use 3D printing to create dental implants and braces.

Example

Custom dental crowns.

Exam Tip

Dental Industry = Major User of 3D Printing

DESIGN AND FURNITURE

Designers create decorative items and furniture prototypes.

Example

Designer lamps.

Exam Tip

Design Industry = Rapid Prototyping

FORENSIC SCIENCE

3D printing helps reconstruct bones and body parts during investigations.

Example

Reconstructing a damaged skull.

Exam Tip

Forensic Pathology Uses 3D Reconstruction

CRIME INVESTIGATION

Damaged evidence can be reconstructed using 3D technology.

Example

Recreating a broken weapon recovered from a crime scene.

Exam Tip

3D Printing Helps Preserve Evidence

QUICK REVISION TABLE

Application	Use
Architecture	Building Models
Eyewear	Customized Glasses
Dental	Crowns and Implants
Design	Lamps and Furniture
Forensics	Bone Reconstruction
Crime Investigation	Evidence Reconstruction

ROBOTIC PROCESS AUTOMATION (RPA)

Robotic Process Automation (RPA) is the use of software robots (bots) to automate repetitive, rule-based, and routine business tasks.

RPA does not involve physical robots. Instead, it uses software programs that imitate human actions while interacting with computer applications.

These software robots can perform tasks faster, more accurately, and continuously without fatigue.

Example

A software bot automatically enters customer information into a database.

Exam Tip

RPA = Software Robots Automating Repetitive Tasks

FEATURES OF RPA

Automation of Repetitive Tasks

Performs routine work automatically.

Example

Copying data from one application to another.

Mimics Human Actions

Software robots work like human users.

Example

Clicking buttons and entering information.

Improves Efficiency

Tasks are completed faster and more accurately.

Example

Automatic invoice processing.

Reduces Human Errors

Minimizes mistakes caused by manual operations.

Example

Automated banking transactions.

Exam Tip

RPA = Fast + Accurate + Automated

APPLICATIONS OF RPA

CUSTOMER SERVICE

RPA automates customer support activities.

Example

Automatic verification of documents.

Exam Tip

Customer Service = Faster Response

HEALTHCARE

Hospitals use RPA for managing patient records and billing.

Example

Automatic patient record management.

Exam Tip

Healthcare + RPA = Administrative Automation

SUPPLY CHAIN MANAGEMENT

RPA automates procurement and inventory tracking.

Example

Automatic stock monitoring.

Exam Tip

Supply Chain = Inventory Automation

FINANCIAL SERVICES

Financial institutions use RPA for account management and insurance claims.

Example

Automatic loan processing.

Exam Tip

Finance + RPA = Faster Transactions

ACCOUNTING

RPA automates accounting operations and reporting.

Example

Automatic generation of financial reports.

Exam Tip

Accounting = Automated Bookkeeping

FIFTH GENERATION (5G)

5G stands for **Fifth Generation Mobile Network Technology**.

It is the latest generation of wireless communication technology designed to provide significantly faster internet speeds, lower latency, and support for a much larger number of connected devices compared to previous generations.

5G improves communication between smartphones, computers, IoT devices, autonomous vehicles, and smart cities.

Example

Downloading a full HD movie within seconds using a 5G network.

Exam Tip

5G = High Speed + Low Latency + Massive Connectivity

FEATURES OF 5G

Ultra-High Speed

Much faster than 4G networks.

Example

Downloading large files within seconds.

Exam Tip

5G Speed ≈ Up to 100 Times Faster than 4G

Low Latency

Responses occur almost instantly.

Example

Remote surgery using real-time communication.

Exam Tip

Latency = Delay in Communication

Massive Connectivity

Supports millions of connected devices.

Example

Smart cities with thousands of IoT sensors.

Exam Tip

5G Supports More Devices Than Previous Generations

Better Reliability

Provides more stable and efficient connections.

Example

Smooth video conferencing.

Exam Tip

Reliable Communication Network

ADVANTAGES OF 5G

GREATER SPEED IN TRANSMISSION

5G can achieve extremely high data transfer speeds.

Example

Downloading a 4K movie in seconds.

Exam Tip

Maximum Speed ≈ 15–20 Gbps

LOWER LATENCY

Response times are much shorter compared to 4G.

Example

Real-time online gaming.

Exam Tip

5G Latency ≈ 10 Times Lower Than 4G

GREATER NUMBER OF CONNECTED DEVICES

Millions of devices can communicate simultaneously.

Example

Smart city infrastructure.

Exam Tip

Massive IoT Support

NEW TECHNOLOGY OPPORTUNITIES

Enables the development of advanced technologies.

Example

Autonomous vehicles and smart factories.

Exam Tip

5G Drives Future Technologies

DISADVANTAGES OF 5G

OBSTRUCTIONS AFFECT CONNECTIVITY

High-frequency signals cannot travel long distances and are blocked by obstacles.

Example

Buildings reducing signal strength.

Exam Tip

Major Challenge = Short Signal Range

LIMITED RURAL ACCESS

Rural areas may not immediately receive complete 5G coverage.

Example

Remote villages lacking 5G towers.

Exam Tip

Urban Areas Benefit First

BATTERY DRAIN

Devices connected to 5G consume more power.

Example

Smartphones requiring more frequent charging.

Exam Tip

5G = Higher Battery Consumption

DEVICE HEATING

Some devices become hotter while operating on 5G networks.

Example

Smartphone heating during heavy 5G usage.

Exam Tip

Battery Drain and Heating are Common 5G Issues

QUICK REVISION TABLE

Technology	Remember As
3D Printing	Layer-by-Layer Manufacturing
STL	Standard Tessellation Language
RPA	Software Robot Automation
5G	Fifth Generation Network
Low Latency	Reduced Delay
High Speed	Fast Data Transfer
Massive Connectivity	Millions of Devices