UGC-NET Paper I Unit VIII: Information and Communication Technology – Notes

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1. Common ICT Abbreviations

Abbreviation	Full form
ICT	Information and Communication Technology
CPU / ALU / CU	Central Processing Unit / Arithmetic Logic Unit / Control Unit
RAM / ROM	Random Access Memory / Read Only Memory
BIOS	Basic Input Output System
OS	Operating System
GUI	Graphical User Interface
USB	Universal Serial Bus
HTML	HyperText Markup Language
HTTP / HTTPS	HyperText Transfer Protocol / HTTP Secure
URL	Uniform Resource Locator
WWW	World Wide Web
ISP	Internet Service Provider
IP / TCP	Internet Protocol / Transmission Control Protocol
DNS	Domain Name System
FTP	File Transfer Protocol
SMTP	Simple Mail Transfer Protocol (sending e-mail)
POP3 / IMAP	Post Office Protocol 3 / Internet Message Access Protocol (receiving e-mail)
LAN / MAN / WAN / PAN	Local / Metropolitan / Wide / Personal Area Network
Wi-Fi	Wireless Fidelity
VoIP	Voice over Internet Protocol
PDF	Portable Document Format
AI / IoT	Artificial Intelligence / Internet of Things
SaaS / PaaS / IaaS	Software / Platform / Infrastructure as a Service
MOOC	Massive Open Online Course
OCR	Optical Character Recognition
CC / BCC	Carbon Copy / Blind Carbon Copy

2. Computer Basics

Components: input devices (keyboard, mouse, scanner, microphone), CPU (ALU, control unit, registers), memory, storage, and output devices (monitor, printer, speaker).

Memory

- **Primary memory:** RAM (volatile, temporary working memory) and ROM (non-volatile, holds start-up instructions).
- **Cache memory:** very fast memory between CPU and RAM. Registers inside the CPU are the fastest of all.
- **Secondary storage:** hard disk, SSD, optical discs, pen drives (non-volatile).

Units of memory

Unit	Equals
1 nibble	4 bits
1 byte	8 bits
1 KB	1,024 bytes
1 MB	1,024 KB
1 GB	1,024 MB
1 TB	1,024 GB
1 PB	1,024 TB

Number systems: binary (base 2), octal (base 8), decimal (base 10), hexadecimal (base 16). Example: decimal 10 = binary 1010.

Software: system software (operating systems such as Windows, Linux, macOS, Android) and application software (word processors, spreadsheets, browsers). Open-source software has publicly available source code (Linux, LibreOffice).

3. Internet

- The internet is a global network of networks using the TCP/IP protocol suite.
- **ARPANET** (USA, 1969) was its forerunner.
- The **World Wide Web** was invented by **Tim Berners-Lee** (1989, at CERN); it is a system of linked web pages accessed through browsers.
- **IP address:** IPv4 is 32-bit (e.g. 192.168.1.1); IPv6 is 128-bit.
- **DNS** translates domain names (e.g. ugc.gov.in) into IP addresses.
- **Domains:** .com (commercial), .org, .edu, .gov, .ac.in (Indian academic), .in (India).
- **Search engines:** Google, Bing; **browsers:** Chrome, Firefox, Edge, Safari.

Intranet and extranet

Internet	Intranet	Extranet
Public, global network	Private network within an organisation	Intranet extended to authorised outsiders (partners, suppliers)

4. E-mail

- E-mail address format: username@domain.
- **To:** main recipient; **CC:** copy visible to all; **BCC:** hidden copy.
- **Spam:** unsolicited bulk e-mail. **Attachment:** a file sent with an e-mail.
- Protocols: SMTP (sending), POP3 and IMAP (receiving; IMAP keeps mail synchronised on the server).
- Netiquette: clear subject line, brief message, polite tone, avoid all capitals.

5. Audio and Video Conferencing

- **Audio conferencing:** voice meeting among three or more people over phone or internet.
- **Video conferencing:** real-time audio-visual meetings (Zoom, Google Meet, Microsoft Teams, Cisco Webex).
- Uses **VoIP**, webcams, microphones, screen-sharing and recording.
- Advantages: saves travel time and cost; enables online classes, viva-voce and webinars. Limitations: bandwidth, digital divide, 'Zoom fatigue'.
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6. Networks and Cloud

Network	Coverage
PAN	Very small area (Bluetooth devices)
LAN	Building or campus
MAN	City
WAN	Country or world (the internet is the largest WAN)

Topologies: bus, star (central hub), ring, mesh, tree, hybrid.

Cloud computing: on-demand computing services over the internet. Models: SaaS (e.g. Gmail, Google Docs), PaaS, IaaS. Deployment: public, private, hybrid cloud.

7. Cyber Security

Threat	Meaning
Virus	Malicious code that attaches to files and spreads when they run
Worm	Self-replicating malware that spreads through networks on its own
Trojan horse	Malware disguised as useful software
Ransomware	Encrypts files and demands payment
Phishing	Fraudulent messages to steal passwords or bank details
Spyware	Secretly collects user information

Protection: firewalls (filter network traffic by rules), antivirus software, encryption, strong passwords, two-factor authentication, regular updates and backups. CERT-In is India's national agency for responding to cyber-security incidents.

8. Digital Initiatives in Higher Education

Initiative	Description
NMEICT (National Mission on Education through ICT), 2009	Umbrella mission that funded e-content, virtual labs, connectivity and many platforms below
SWAYAM (2017)	Free online courses (MOOCs) from school to PG level; four quadrants; credit transfer allowed
SWAYAM Prabha (2017)	DTH channels telecasting educational programmes 24×7
NPTEL	Online engineering and science courses by the IITs and IISc
e-PG Pathshala	UGC / INFLIBNET e-content for postgraduate subjects
National Digital Library of India (NDLI)	Single-window digital library developed by IIT Kharagpur
Shodhganga	INFLIBNET repository of Indian PhD theses
Shodhgangotri	Repository of research synopses
e-ShodhSindhu	Consortium for access to e-journals and databases
Vidwan	Database of experts and researchers (INFLIBNET)
Virtual Labs	Online laboratory experiments for science and engineering
Spoken Tutorial and FOSSEE (IIT Bombay)	Training in free and open-source software
National Academic Depository (NAD)	Digital repository of academic awards, integrated with DigiLocker
Academic Bank of Credits (ABC), 2021	Digital storage of credits; supports multiple entry and exit under NEP 2020
PM eVidya (2020)	Unified multi-mode access to digital education
DIKSHA (2017)	Digital platform for school teachers and students
One Nation One Subscription	Nationwide access to international journals for government higher education and research institutions (approved 2024)
SAMARTH	e-Governance platform for university administration

INFLIBNET (Information and Library Network) Centre, Gandhinagar, is an Inter-University Centre of the UGC that runs several of these services.

9. ICT and Governance

E-governance is the use of ICT to deliver government services, exchange information and improve transparency.

Model	Meaning	Example
G2C	Government to Citizen	Online certificates, DigiLocker
G2B	Government to Business	GST portal, GeM
G2G	Government to Government	e-Office, data sharing between departments
G2E	Government to Employee	Online payroll, HR systems

Key milestones and platforms

Initiative	Year	Purpose
Information Technology Act	2000 (amended 2008)	Legal framework for e-commerce, digital signatures and cyber crimes
National e-Governance Plan (NeGP)	2006	Mission Mode Projects for e-services
Aadhaar (UIDAI)	2009	Unique digital identity
MyGov	2014	Citizen participation platform
Digital India	2015	Digital infrastructure, services on demand, digital empowerment
DigiLocker	2015	Cloud storage of official documents
Government e-Marketplace (GeM)	2016	Online public procurement
UMANG	2017	Single mobile app for many government services
Common Service Centres (CSCs)	—	Village-level access points for e-services

Benefits: transparency, efficiency, speed, reduced corruption, cost savings, and citizen convenience.

Challenges: digital divide, digital literacy, cyber security, data privacy, language barriers and infrastructure gaps.