



UNIVERSITY GRANTS COMMISSION

NET BUREAU

SYLLABUS

Subject: GENERAL PAPER ON TEACHING & RESEARCH APTITUDE

Code No. : 00

PAPER-I

The main objective is to assess the teaching and research capabilities of the candidates. The test aims at assessing the teaching and research aptitude as well. Candidates are expected to possess and exhibit cognitive abilities, which include comprehension, analysis, evaluation, understanding the structure of arguments, deductive and inductive reasoning. The candidates are also expected to have a general awareness about teaching and learning processes in higher education system. Further, they should be aware of interaction between people, environment, natural resources and their impact on the quality of life.

The details of syllabi are as follows:

Unit-I Teaching Aptitude

- Teaching: Concept, Objectives, Levels of teaching (Memory, Understanding and Reflective), Characteristics and basic requirements.
- Learner's characteristics: Characteristics of adolescent and adult learners (Academic, Social, Emotional and Cognitive), Individual differences.
- Factors affecting teaching related to: Teacher, Learner, Support material, Instructional facilities, Learning environment and Institution.
- Methods of teaching in Institutions of higher learning: Teacher centred vs. Learner centred methods; Off-line vs. On-line methods (Swayam, Swayamprabha, MOOCs etc.).

- Teaching Support System: Traditional, Modern and ICT based.
- Evaluation Systems: Elements and Types of evaluation, Evaluation in Choice Based Credit System in Higher education, Computer based testing, Innovations in evaluation systems.

Unit-II Research Aptitude

- Research: Meaning, Types, and Characteristics, Positivism and Post-positivistic approach to research.
- Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods.
- Steps of Research.
- Thesis and Article writing: Format and styles of referencing.
- Application of ICT in research.
- Research ethics.

Unit-III Comprehension

- A passage of text be given. Questions be asked from the passage to be answered.

Unit-IV Communication

- Communication: Meaning, types and characteristics of communication.
- Effective communication: Verbal and Non-verbal, Inter-Cultural and group communications, Classroom communication.
- Barriers to effective communication.
- Mass-Media and Society.

Unit-V Mathematical Reasoning and Aptitude

- Types of reasoning.
- Number series, Letter series, Codes and Relationships.
- Mathematical Aptitude (Fraction, Time & Distance, Ratio, Proportion and Percentage, Profit and Loss, Interest and Discounting, Averages etc.).

Unit-VI Logical Reasoning

- Understanding the structure of arguments: argument forms, structure of categorical propositions, Mood and Figure, Formal and Informal fallacies, Uses of language, Connotations and denotations of terms, Classical square of opposition.
- Evaluating and distinguishing deductive and inductive reasoning.
- Analogies.
- Venn diagram: Simple and multiple use for establishing validity of arguments.
- Indian Logic: Means of knowledge.
- Pramanas: Pratyaksha (Perception), Anumana (Inference), Upamana (Comparison), Shabda (Verbal testimony), Arthapatti (Implication) and Anupalabddhi (Non-apprehension).
- Structure and kinds of Anumana (inference), Vyapti (invariable relation), Hetvabhasas (fallacies of inference).

Unit-VII Data Interpretation

- Sources, acquisition and classification of Data.
- Quantitative and Qualitative Data.
- Graphical representation (Bar-chart, Histograms, Pie-chart, Table-chart and Line-chart) and mapping of Data.
- Data Interpretation.
- Data and Governance.

Unit-VIII Information and Communication Technology (ICT)

- ICT: General abbreviations and terminology.
- Basics of Internet, Intranet, E-mail, Audio and Video-conferencing.
- Digital initiatives in higher education.
- ICT and Governance.

Unit-IX People, Development and Environment

- Development and environment: Millennium development and Sustainable development goals.
- Human and environment interaction: Anthropogenic activities and their impacts on environment.
- Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions.
- Impacts of pollutants on human health.
- Natural and energy resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests.
- Natural hazards and disasters: Mitigation strategies.
- Environmental Protection Act (1986), National Action Plan on Climate Change, International agreements/efforts -Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance.

Unit-X Higher Education System

- Institutions of higher learning and education in ancient India.
- Evolution of higher learning and research in Post Independence India.
- Oriental, Conventional and Non-conventional learning programmes in India.
- Professional, Technical and Skill Based education.
- Value education and environmental education.
- Policies, Governance, and Administration.

NOTE:

- (i) Five questions each carrying 2 marks are to be set from each Module.
- (ii) Whenever graphical/pictorial question(s) are set for sighted candidates, a passage followed by equal number of questions and weightage be set for visually impaired candidates.

SYLLABUS

Sub Unit – 1: ICT: General Abbreviations and Terminology

SL. NO	TOPICS
1	1. Introduction
2	2. Meaning of Information and Communication Technology
3	3. Data and Information
4	4. Number system
5	5. Application of Information Technology
6	6. Computer architecture
7	7. Evolution of Computer
8	8. Operating System
9	9. Programming languages
10	10. Virus
11	11. Multimedia
12	12. General Abbreviation and Terminology
13	13. Miscellaneous

Sub Unit – 2: Basics of Internet, Internet, E-mail, Audio and Video Conferencing

SL. NO	TOPICS
14	14. What is internet
15	15. Types of Network
16	16. Software and Hardware requirement for internet
17	17. IP address
18	18. Benefits of internet
19	19. Internet Miscellaneous
20	20. E-mail
21	21. Audio and video conferencing

Sub Unit – 3: Digital Initiatives in Higher Education

SL. NO	TOPICS
22	22. Objective Of Using ICT in Higher Education
23	23. Major ICT Learning Categories
24	24. Recent ICT Initiatives in Higher Education
25	25. Major Initiatives In India for Providing E-Content for Different Courses
26	26. Key Challenges in ICT Adoption in India Universities

Sub Unit – 4: Data and Governance

SL. NO	TOPICS
27	27. Introduction
28	28. E-Governance in India
29	29. Recent Initiatives
30	30. Central Government Initiatives
31	31. State Government Initiatives
32	32. Advantage of E-Governance
33	33. Problem of Implementing E-Governance in India

Section – 1: At a Glance

Sub Unit – 1: ICT: General Abbreviations and Terminology

MEANING OF INFORMATION AND COMMUNICATION TECHNOLOGY:

Information and Communication Technologies (ICT), are responsible for the study, development, implementation, storage and distribution of information through the use of hardware and software as a means of computer system.

APPLICATION OF INFORMATION TECHNOLOGY: Several application of Information Technology is (1) education, (2) communication, (3) job creation, (4) agriculture, and (5) entertainment.

EVOLUTION OF COMPUTER: Evolution of computer technology can be divided into five generations. They are **First generation** (1943-1958), **Second generation** (1959-1965), **Third generation** (1966-1973), **Fourth generation** (1974-1990), **Fifth generation** (1990 onwards)

GENERAL ABBREVIATION: A huge number of abbreviations or short forms are used information technology. Some useful abbreviations and their full forms are given here.

Sub Unit – 2: Basics of Internet, Internet, E-mail, Audio and Video Conferencing

INTERNET: The internet is a network of global exchange – including private, public, business, academic and government networks.

BENEFITS OF INTERNET: Today, the Internet is the solution to our all problems. Internet takes a very important place in Communication, marketing, problem solving, entertainment etc.

E-MAIL: Electronic mail (e-mail) is defined as the transmission of messages over communication network. There are various email providers such as Yahoo, Gmail and Hotmail etc.

AUDIO AND VIDEO CONFERENCING: Audio conferencing is the conduct of an audio conference between two or more people in different location using a series of devices. Video conferencing is a technology that allows users in different location to hold face-to-face meeting without having to move to a single location together.

Sub Unit – 3: Digital Initiatives in Higher Education

OBJECTIVE OF USING ICT IN HIGHER EDUCATION: E-learning, distance education, digital textbooks, virtual laboratories and other new words and concepts are getting in focus of researchers and educators worldwide.

RECENT ICT INITIATIVES IN HIGHER EDUCATION: A number of initiatives have been taken by the MHRD to promote digital education literacy: they are online courses, providing education through DTH, e-books and documents are provided through digital library.

CHALLENGES IN ICT ADOPTION IN INDIA UNIVERSITIES: There are several challenges to adopt ICT in Indian universities in higher education; they are lack of knowledge, pace of change, funding, changing roles and norms, sustainability and scale etc.

Sub Unit – 4: Data and Governance

E-GOVERNANCE: Electronic governance or e-governance is the application of ICT for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and services.

RECENT INITIATIVES: Types of Government Interaction in e-governance are Government to Government, Government to Citizen, Government to Business and Government to Employee.

ADVANTAGE OF E-GOVERNANCE: Technology makes communication speedier. It also reduces the stationary cost. Use of ICT makes governing process transparent. Once the governing process is made transparent the Government is automatically made accountable.

Section – 2: Key Statements

Every candidates appearing for NET/SET examination should follow these key (main) points those can help them a better understanding regarding this unit very quickly.

Key Statements:

(1); Meaning of Information and Communication Technology (2); Data and Information (3); Number system (4); Application of Information Technology (5); Computer architecture (6); Evolution of Computer (7); Operating System(8); Programming languages (9); Virus (10); Multimedia (11); General Abbreviation and Terminology(12); Definition of Internet(14); Types of Network(15); Software and Hardware requirement for internet(16); IP address(17); E-mail(20); Audio and video conferencing(21); Objective Of Using ICT in Higher Education(22); Recent ICT Initiatives in Higher Education(24); Key Challenges in ICT Adoption in India Universities(26); What is E-Governance? (27); E-Governance in India(28); Recent E-Governance initiatives(29); Central Government E-Governance Initiatives(30); State Government E-Governance Initiatives(31); Advantage of E-Governance(32)

[N.B. – Numbers in parenthesis are the reference number]

Section – 3: Key Facts and Figures

Sub Unit – 1

ICT: General Abbreviations and Terminology

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1. Introduction

- (i) Information and communications technology (ICT) is an extensional term for information technology (IT).
- (ii) Students should be computer literate.
- (iii) The ICT curriculum provides students with knowledge, practical skills and an understanding of the processes involved in problem-solving using technology.
- (iv) Information society is a term for a society in which the creation distribution and manipulation of information has become the most significant economic and cultural activity. For the information society the post-industrial society is designated.

2. Meaning of Information and Communication Technology

Information and Communication Technologies (ICT), are responsible for the study, development, implementation, storage and distribution of information through the use of hardware and software as a means of computer system.

3. Data and Information

- (i) **Data** is distinct pieces of information, usually formatted in a special way.
- (ii) All software is divided into two general categories: data and programs.
- (iii) Programs are collections of instructions for manipulating data. Data is represented with the help of characters such as alphabets (A-Z, a-z), digits (0-9) or special characters (+, -, /, *, <, >, = etc.) expressing
- (iv) **Information** is stimuli that have meaning in some context for its receiver. When information is entered into and stored in a computer, it is generally referred to as data.

4. Number System

A number system is a writing system for expressing numbers. Two types of number system are there. They are positional and non-positional number system. First one is the widely used number system.

Base or Radix of a Number System: The total number of different symbols which are used in a particular number system is called the base or radix.

Types of Positional number system:

Decimal Number System: In decimal number system 10 is the base and 0, 1, 2, ..., 9 are the different 10 digits. Example: $(25)_{10}$

Binary Number System: In binary number system 2 is the base. Two different digits are 0, 1. Example: $(1011)_2$

Octal Number System: In octal number system 8 is the base. Eight different digits are 0, 1, 2, ..., 7. Example: $(45)_8$

Hexadecimal Number System: In hexadecimal number system 16 is the base. Sixteen different digits are 0, 1, 2, ..., 9 and A, B, C, D, E, F. Example: $(4A)_{16}$

Decimal to Binary conversion:

$$(25)_{10} = (?)_2$$

2	25	Remainder
2	12	→ 1
2	6	→ 0
2	3	→ 0
2	1	→ 1
	0	→ 1

$$(25)_{10} = (11001)_2$$

$$(15)_{10} = (00001111)_2$$

$$(-15)_{10} = (11110001)_2$$

Binary to Decimal conversion:

$$(1011)_2 = 1*2^3 + 0*2^2 + 1*2^1 + 1*2^0 = 8 + 0 + 2 + 1 = (11)_{10}$$

$$(0.101)_2 = \frac{1}{2} + 0 + \frac{1}{8} = 0.5 + 0.125 = (0.625)_{10}$$

5. Application of Information Technology

Information Technology is a general term that describes any technology that helps to produce, manipulate, store, communicate and/or disseminate information. Presumably, when speaking of Information Technology as a whole, it is noted that the use of computers and information

are associated. Several applications of Information Technology are (1) education, (2) communication, (3) job creation, (4) agriculture, and (5) entertainment.

- (i) **Online Education:** With the introduction of online education services, students can learn from anywhere using the internet.
- (ii) **Communication:** Mobile phones have made communication more convenient and social networks like “Facebook.com” have played a significant role in communication.
- (iii) **Job Creation:** Today, so many companies which have been created using information technology and this have solved the problem of job scarcity to a certain degree.
- (iv) **Modernized Agriculture:** Information technology has also played a prominent role in advancing the agricultural sector.
- (v) **Modernized Entertainment:** The invention of technologies like Ipads, video games, home entertainment system, enhances user life.

6. Computer Architecture (Von Neumann Architecture)

Von Neumann architecture was first published by John von Neumann in 1945. His computer architecture design consists of a Control Unit, Arithmetic and Logic Unit (ALU), Memory Unit, Inputs/Outputs. Von Neumann architecture is based on the stored-program computer concept, where instruction data and program data are stored in the same memory. This design is still used in most computers produced today.

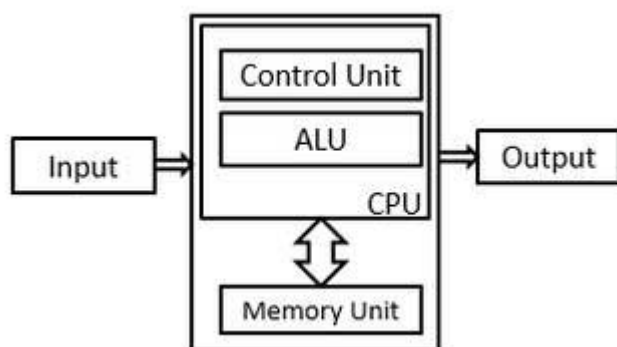


Fig: Von Neumann Architecture

Central Processing Unit (CPU): The Central Processing Unit (CPU), The brain of a computer, is the electronic circuit responsible for executing the instructions of a computer program. It is sometimes referred to as the microprocessor or processor. The CPU contains the ALU, CU.

- **Arithmetic and Logic Unit (ALU):** The ALU allows arithmetic (add, subtract etc.) and logic (AND, OR, NOT etc.) operations to be carried out.
- **Control Unit (CU):** The control unit controls the operation of the computer's ALU, memory and input/output devices, telling them how to respond to the program instructions it has just read and interpreted from the memory unit. The control unit also provides the timing and control signals required by other computer components.

Memory Unit: The memory unit consists of RAM and ROM, sometimes referred to as primary or main memory. Unlike a hard drive (secondary memory), this memory is fast and also directly accessible by the CPU.

Input and Output Unit: Input unit is used to insert required input and output unit gives the desired output. In advanced computer keyboard, joystick, mouse are input device and monitor, printer, projector are output device.

7. Evolution of Computer

Computer is an electronic device that can store, retrieve and process both qualitative and quantitative data quickly and accurately. Computer processes information error free. It can hold data for any length of time. It cannot think at its own. ROM is a type of memory circuitry that holds the computer's start up routine.

The evolution of computers started way back in the late 1930s. Binary arithmetic is at the core of the computers of all times. History of computers dates back to the invention of a mechanical adding machine in 1642. Abacus, an early computing tool, invention of logarithm by John Napier and the invention of slide rules by William Oughtred were significant events in the evolution of computers. Evolution of computer technology can be divided into five generations.

(i) First generation computer consisted of vacuum tubes and they were used from 1943-1958.

ENIAC (Electronic Numerical Integrator and Calculator) computer is an example of first generation computer.

(ii) Second generation (1959-1965) computer consisted of transistors i.e. vacuum tubes were replaced by transistors. Thus the size of the computer got reduced considerably.

- (iii) **Third generation** (1966-1973) computer consisted of integrated circuits (IC) i.e. many transistors in single silicon chip. A single IC has many transistors, registers and capacitors built on a single thin slice of silicon.
- (iv) **Fourth generation** of computer evolution started with the invention of microprocessor and present day computers are also categorized in the fourth generation.
- (v) **Fifth generation** computers are under development. They are going to be based on principles of artificial intelligence and natural language recognition.

Generation	Duration	Memory device
First	(1943-1958)	Vacuum tubes
Second	(1959-1965)	Transistor
Third	(1966-1973)	LSI (Large Scale Integration) IC
Fourth	(1974-1990)	VLSI (Very large Scale Integration) Microprocessor.
Fifth	(1990 onwards)	Biochips (concept of AI)

8. Operating System

Definition: An operating system is a program that acts as an interface between the software and the computer hardware. It is an integrated set of specialized programs used to manage overall resources and operations of the computer. Example: Windows XP, UNIX, Linux etc.

Popular Operating System:

Windows: Generally referred to as the Microsoft Windows, these OS are manufactured and developed by the tech-giant Microsoft and are the most commonly used OS for personal computers. There are many versions of Windows that has been developed since 1985, but few that revolutionized the industry of Operating System are: Windows 95, Windows 98, Windows NT, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10 (Latest).

UNIX: Developed in 1970 in the Bell Lab research center UNIX became a multitasking and multiuser operating system, reaching numerous platforms for use. It was developed by Ken Thompson, Dennis Ritchie, and few others and later AT&T licensed UNIX to the development of many variants of Unix.

Linux: Primarily derived from the concept of Unix, Linux became the most-prominent free and open-source OS available to everyone in the world. It is built around the Linux kernel and served for both the desktop and server use.

Solaris: This OS was originally developed by Sun Microsystems and is a type of Unix OS. Solaris was developed as proprietary software. Solaris is known for its scalability, especially on SPARC systems, and for originating many innovative features such as D Trace, ZFS and Time Slider.

BOSS: It stands for *Bharat Operating System Solutions* designed specifically by India for Indians. It was developed by C-DAC(Centre for Development of Advanced Computing), Chennai, to benefit the Free/Open Source Software's in India.

Apple macOS: Apple's macOS, successor to the popular OS X operating system, runs on Apple laptops and desktops. Based in part on the historic family of Unix operating systems dating back to research in the 1960s at AT&T's Bell Labs, macOS shares some features with other Unix-related operating systems including Linux.

Android: Android is a mobile operating system developed by Google. It is based on modified version of Linux. It is designed for touch screen mobile.

9. Programming Languages

A programming language is a vocabulary and set of grammatical rules for instructing a computer or computing device to perform specific tasks. The term programming language usually refers to high-level languages.

Examples: BASIC, C, C++, COBOL, Java, FORTRAN etc.

Some Popular Programming Languages:

JavaScript: It seems impossible to be a software developer these days without using JavaScript. The first one in the list is JavaScript, it seems impossible to imagine software development without JavaScript.

Python: Like Java, Python syntax is clear, intuitive and almost similar to the English language. Python's "object-based" subset is somewhere similar to JavaScript.

Java: Java is highly cross-platform compatible or platform independent. Since you can code anywhere (I mean on all devices), compile into low-level machine code, and finally, execute on any platform using JVM – Java Virtual Machine

C/CPP: Linux OS is C based. And CPP is the hybrid version of C. C++ is an object-oriented programming language and which is built on C; therefore it is preferred over others for designing higher-level applications.

PHP: PHP stands for Hypertext Preprocessor, is a general-purpose programming language. Clearly, PHP is a scripting language, which runs on a server, and it is used to create web pages written in HTML.

SQL: SQL stands for Structured Query Language, is a programming language to operate databases. It includes storing, manipulating and retrieving data stored in a relational database.

Open Source Software: Open source software is a type of software in which source code is released under a license in which the copy right holder grants users the right to study, change, and distribute the software to any other for any purpose. Example- **Mozilla** Firefox

Driver: Software that allows interaction between peripheral devices and the operating system.

10. Virus

A virus is a computer program that can replicate itself and spread from one computer to another. Viruses can enter your computer as attachments to an email or in a downloaded file, or they can be hidden on a zip drive or CD. It's usually not obvious that a virus is present. It also called Daughter board.

11. Multimedia

Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.

12. General Abbreviation and Terminology

ASCII—American Standard Code for Information Interchange

API—Application Programming Interface

ATA—Advanced Technology Attachment

ATM—Asynchronous Transfer Mode

bin—binary

bit -- binary information term

BASIC—Beginner's All-Purpose Symbolic Instruction Code

BIOS—Basic Input Output System

BCD—Binary Coded Decimal

BW—Bandwidth

CAD—Computer-Aided Design

CPU—Central Processing Unit

CIM—Common Information Model

CRS—Computer Reservations System

CRT—Cathode Ray Tube

CLI—Command Line Interface

CDMA—Code Division Multiple Access

CMOS—Complementary Metal-Oxide Semiconductor

CSI—Common System Interface

CD-R—CD-Recordable

CD-ROM—CD Read-Only Memory

CD-RW—CD-Rewritable

COBOL—Common Business-Oriented Language

CGI—Common Gateway Interface /Computer-Generated Imagery

CSS -- Cascading style sheets

DAO—Data Access Objects

HTML—Hypertext Markup Language

DVD—Digital Video Disc

DVD-R—DVD-Recordable

DVD-ROM—DVD-Read Only Memory

DVD-RW—DVD-Rewritable

DOS—Disk Operating System

DPI -- Dots Per Inch
DDR—Double Data Rate
DNS—Domain Name System
EEPROM—Electrically Erasable Programmable Read-Only Memory
ENIAC—Electronic Numerical Integrator And Computer
EBCDIC—Extended Binary Coded Decimal Interchange Code
EPROM—Erasable Programmable Read-Only Memory
FAT—File Allocation Table
FDD—Floppy Disk Drive
FTP—File Transfer Protocol
Gb—Gigabit / GB—Gigabyte
GIF—Graphics Interchange Format
GPRS—General Packet Radio Service
HDD—Hard Disk Drive
HD DVD—High Definition DVD
HTTP—Hypertext Transfer Protocol
Hz—Hertz
IBM—International Business Machines
IC—Integrated Circuit
ICMP—Internet Control Message Protocol
ICT—Information and Communication Technology
IDE—Integrated Development Environment /Integrated Drive Electronics
IE—Internet Explorer
IMAP—Internet Message Access Protocol
I/O— Input / Output
IP—Intellectual Property /Internet Protocol
IRC -- Internet Relay chat
ISDN—Integrated Services Digital Network
ISP—Internet Service Provider
IT—Information Technology
KB—Keyboard /Kilobyte /Knowledge Base
Kb—Kilobit
kHz—Kilohertz
LED—Light-Emitting Diode

MAN—Metropolitan Area Network
Mb—Megabit
MB—Megabyte
MHz—Megahertz
MIDI—Musical Instrument Digital Interface
MIME -- Multipurpose Internet Mail Extension
MMU—Memory Management Unit
MPEG—Motion Pictures Experts Group
MS-DOS—Microsoft Disk Operating System
MOOC -- massive open online course
NIC—Network Interface Controller
NTFS—New Technology File system
NMEICT -- National mission on Education through ICT
NVRAM—Non-Volatile Random Access Memory
PAN—Personal Area Network
PC—Personal Computer
ROM—Read Only Memory
ROM-DOS—Read Only Memory - Disk Operating System
SATA—Serial Advanced Technology Attachment.
SCSI—Small Computer System Interface
SDRAM—Synchronous Dynamic Random Access Memory
SFTP—Secure FTP /Simple File Transfer Protocol
SHDSL—Single-pair High-speed Digital Subscriber Line
SIMD—Single Instruction, Multiple Data
SIMM—Single Inline Memory Module
SITE --Satellite Instructional Television Experiment
SPI—Serial Peripheral Interface
SVG—Scalable Vector Graphics
SVGA—Super Video Graphics Array
S/MIME -- secure multipurpose internet mail Extension
TB—Tera Byte
TCP/IP—Transmission Control Protocol/Internet Protocol
TDMA—Time Division Multiple Access
TMP — temporary

TTL—Transistor-Transistor Logic
UPS—Uninterruptible Power Supply
URI—Uniform Resource Identifier
URL—Uniform Resource Locator
USB—Universal Serial Bus
UTF—Unicode Transformation Format
UTP—Unshielded Twisted Pair
VB—Visual Basic
WAN—Wide Area Network
Wi-Fi—Wireless Fidelity
WLAN—Wireless Local Area Network
WMA—Windows Media Audio
WMV—Windows Media Video
WPAN—Wireless Personal Area Network
WYSIWYG -- What you see is what you get
WWW – World Wide Web
XML— Extensible Markup Language

13. Miscellaneous

- (i) **Solid State Hard Drive:** Solid State Hard Drive is used for low weight, high storage capacity laptop.
- (ii) Computer cannot process analog signal.
- (iii) Computers can be used for Psychological testing, diagnosing the difficulty of a student in learning a subject.
- (iv) **Strap:** An electronic bill board that has a short text or graphical advertising message is called strap.
- (v) The process of laying out a document with text, graphics, headlines and photographs is involved in Desk top publishing.
- (vi) Data can be saved on backing storage medium known as compact disk rewritable.
- (vii) A key-board has at least 101 keys.
- (viii) Corel draw is a popular illustration program.
- (ix) The accounting software Tally was developed by TCS.
- (x) Bugs are the error in computer program.

Name	Equal To	Size(In Bytes)
Bit	1 bit	1/8
Nibble	4 bits	1/2
Byte	8 bits	1
Kilobyte	1024 bytes	1024
Megabyte	1, 024kilobytes	1, 048, 576
Gigabyte	1, 024 megabytes	1, 073, 741, 824
Terrabyte	1, 024 gigabytes	1, 099, 511, 627, 776

- (xi) Array, stack, queue are linear data structure.
- (xii) Binary number system is used in typical 32-bit computer.
- (xiii) COS is smart card operating system.
- (xiv) Compiler can convert High level programming language to machine language.
- (xv) Consider a a number $(999)_{10} = (1111100111)_2$ So 10 bits required to convert any 3 digit decimal to binary equivalent.
- (xvi) The file extension of MS-word document in office 2007 is .docx
- (xvii) In a hard disk tracks are divided into sectors.
- (xviii) A computer program that translates a program statement by statement into machine language is called an interpreter.
- (xix) An illusion of extremely large memory is called virtual memory.
- (xx) Virtual reality provides participatory experience.
- (xxi) The first virtual university of India camp up in Tamil Nadu.
- (xxii) Image/Graphic file extensions are .png, .gif, .bmp etc.
- (xxiii) Initially BIOS is in the ROM. When the machine is booted BIOS is loaded to the memory.
- (xxiv) The process of copying files to a CD-ROM is known as burning.
- (xxv) CPU Registers, cache memory, main memory (RAM), secondary storage are the lists of computer memory types from highest to lowest speed.
- (xxvi) Web 2.0 applications are focused on the ability for people to collaborate information online.

(xxvii) .com domains are used for profit businesses.

(xxviii) LCD type of technology used on a flat – screen monitor.

(xxix) DPI measures resolution of a laser printer.

(xxx) “CTRL + Z” is a short-cut to “Undo Typing”.

	A	B	C
1	10	16	
2	20	36	
3	8	24	
4	12	28	
5	0	16	

$B2 = A2 + \$B\$1 = 36$ so $B3 = 24$

Sub Unit – 2

Basics of Internet, Internet, E-mail, Audio and Video Conferencing

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14. What is Internet?

- (i) The internet is a globally connected network system that uses TCP/IP to transmit data via various types of media.
- (ii) The internet is a network of global exchange – including private, public, business, academic and government networks.
- (iii) It is connected by guided, wireless and fiber-optic technologies.
- (iv) URL is the name for a webpage address.
- (v) MTNL, BSNL, ERNET India are internet service provider.

The internet can be used to:

- Access a huge ‘library’ of information from the websites around the world through browser.
- Send and receive email messages and share information with your friends and family.
- Buy goods and services.
- Carry out online banking.
- Learn something new with an online course.
- Line/access and avoidance of collision are the main functions of network protocol.
- The initial efforts for internet based communication were for military purposes.

15. Types of Network

The Network allows computers to connect and communicate with different computers via any medium. Router, switch, hub are network devices.

Local Area Network (LAN): It is also called LAN and designed for small physical areas such as an office, group of buildings or a factory. LANs are used widely as it is easy to design and to troubleshoot. Personal computers and workstations are connected to each other through

LANs. We can use different types of topologies through LAN, these are Star, Ring, Bus, Tree etc. Ethernet, Token ring, FDDI are examples of LAN.

Metropolitan Area Network (MAN): It was developed in 1980s. It is basically a bigger version of LAN. It is also called MAN and uses the similar technology as LAN. It is designed to extend over the entire city. It can be means to connecting a number of LANs into a larger network or it can be a single cable. It is mainly hold and operated by single private company or a public company.

Wide Area Network (WAN): It is also called WAN. WAN can be private or it can be public leased network. It is used for the network that covers large distance such as cover states of a country. It is not easy to design and maintain. Communication medium used by WAN are PSTN or Satellite links. WAN operates on low data rates.

16. Software and Hardware Requirement for Internet

Software Requirement: For internet required soft wares are Hypertext Transfer Protocol (HTTP), Internet Message Access Protocol (IMAP), Transmission Control Protocol/ Internet Protocol (TCP/IP), File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP), Hypertext Markup Language (HTML),

Telnet, Uniform Resource Locator (URL), Simple Mail Transfer Protocol (SMTP) etc.

Hardware Requirement: For internet required hardware are Modem, hub, Bridge, Router, Gateway etc.

17. IP Address

IP address is short for *I*nternet *P*rotocol (IP) *a*ddress. An **IP address** is an identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination. Contrast with IP, which specifies the format of packets, also called datagrams, and the addressing scheme. Most IP addresses look like: 132.45.47.55. IP address is different from physical address.

18. Benefits of Internet

Today, the Internet is the solution to our all problems. It is the way of your knowledge. There are some benefits of having internet.

Obtaining Information:

Children and students browse internet for obtaining information about particular things. It is world's biggest source of information so you can find any type information here easily by just making search in major search engines.

Services:

There are numbers of services which are available on the internet like online business, finding jobs, booking tickets for travelling, booking in hotels etc. Moreover, it is extensively used today for the shopping reasons.

Entertainment:

Another benefit of using internet is that you can enjoy a lot on the internet by downloading games, playing games online, listening and downloading songs or videos. It is considered an advanced method of enjoying the life.

Social Networking:

Today, internet is highly used by people to become popular among people and to make new friends. An individual can make thousands of friends, chat with them and can post new photos easily through social networking sites.

Globalization:

Another benefit of the web world is globalization. Internet has gathered the entire world into small screen. You can connect yourself with whole world and share your ideas by posting videos or blogs.

Communication:

There are numbers of IDs like Gmail, Yahoo mail, Hotmail, Rediff and many more; through these ids you can send messages, fax and electronic mails. These all you can done just by sitting in front of computer from any corner of the world.

E-Commerce:

It is the method used for the advertisement purposes whether advertisement is related to any business or any other thing.

Shopping:

Today, majority of people offer shopping online because it is the simplest method of shopping by which you can shop for anything with the help of computer or phone. The shopping done on the internet is known as online shopping and for this there will be no need to visit any place.

News:

In the past, TVS and radios were used to be updated with whole world by news but now you can surf internet and can get all the information about latest news in just 5 minutes.

Marketing:

Internet marketing has gained so much popularity among people and especially businessman. Today, all business owners promote their businesses online.

19. Internet Miscellaneous

- (i) In the hypermedia dataset, information bits are stored in the form of signals.
- (ii) Bus width, the communications bandwidth that has the highest capacity and is used by microwave.
- (iii) Cyber venting is using websites to pour out one's grievances.
- (iv) In web search finding a large number of documents with very little relevant information is poor recall.
- (v) The concept of connect intelligence is derived from value added network.
- (vi) HTML IS basically used to design web page.

- (vii) pop3 and imap are e-mail accounts in which one only has to be connected to the server to send and receive e-mail.
- (viii) Chrome is a browser.
- (ix) Encoding or scrambling data for transmission across a network is known as encryption.
- (x) Google talk is an instant messenger that is used for chatting.
- (xi) Mail merge us to send the same latter to different persons in MS word.
- (xii) HTTP works in application layer.
- (xiii) Data encryption, data hiding is the technology used for internet security.
- (xiv) Transfer of data form one application to another line is known as dynamic data exchange.
- (xv) Bluetooth is a short range wireless technology. It is used to connect device together for data transfer, Bluetooth is a low cost means of data transfer.

20. E-mail

- (i) Email is short form of ‘electronic mail’.
- (ii) It’s defined as the transmission of messages over communication network.
- (iii) An E-mail address is composed of two parts.
- (iv) There are various email providers such as Yahoo, Gmail and Hotmail etc.
- (v) POP is a protocol used by e-mail clients to download e-mails to your computer
- (vi) An unsolicited e-mail message sent to many recipients at once is a spam.
- (vii) Computer data files that are include with an email message are often referred to as attachments.
- (viii) Example of email is **abc@gmail.com**

Key Benefits and Features of using Email

- (i) It’s quick – your recipient receives your email as soon as they go online and collect their mail.
- (ii) It’s secure.
- (iii) It’s low cost.
- (iv) Photos, documents and other files can be attached to an email.
- (v) One email can be sent to more than one recipient at a time.

21. Audio and Video Conferencing

Audio conferencing:

- (i) Audio conferencing is the conduct of an audio conference between two or more people in different location using a series of devices.
- (ii) It allows sound to be sent and received for the purpose of communication and collaboration simultaneously.
- (iii) It can be conduct either through telephone or internet.
- (iv) Use of an ordinary telephone as an internet appliance is called voice line.

Video Conferencing

- (i) Video conferencing is a technology that allows users in different location to hold face-to-face meeting without having to move to a single location together.
- (ii) This technology is particularly convenient for business users in different places because it saves time, expense and hassle associated with business travel.
- (iii) Video conferencing's main advantage over teleconferencing is that users can see each other.
- (iv) Video transmission over the internet that looks like delayed live casting is called real time video.

Sub Unit – 3

Digital Initiatives in Higher Education

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22. Objective of using ICT in Higher Education

- (i) E-learning, distance education, digital textbooks, virtual laboratories and other new words and concepts are getting in focus of researchers and educators worldwide.
- (ii) However, real benefit will come when they spread throughout academic and educational community.
- (iii) In order to do that educational policy and decision makers should have clear understanding of the benefits and costs of ICT.
- (iv) The leverage of ICT in education can be broadly separated in three areas: administrative, technical and other supportive functions for education.
- (v) To improve access and quality in higher education, the knowledge Commission recommendations include Use of ICT for production of knowledge, establishment of a network of institution of higher learning, Increase in the enrolment of student in the institutions of higher learning

23. Major ICT Learning Categories

Types of ICT tools	Definition	Examples
Educational Networking	Online learning platform that connect learners using social networking technologies.	Elgee, Classroom 2.0
Web-based Learning	Online services that expand learners' abilities to interact and collaborate with each other.	Wiki, blog, podcasting, social bookmarking
Mobile Learning	Mobile devices or technologies used for educational purposes.	Smartphone, PDA, interactive response pad
Classroom Equipment	Devices that are used in classrooms to facilitate the interaction between teachers and students.	Interactive white board, touch-screen computer

24. Recent ICT Initiatives in Higher Education

A number of initiatives have been taken by the MHRD to promote digital education literacy in the country.

- (i) Online courses to cover all higher education subjects and skill sector courses.
- (ii) Provide education by educational channels through DTH (Direct to Home) across the country.
- (iii) E-books and documents are provided through digital library.
- (iv) For science students virtual lab is provided to remote-access laboratories in various disciplines of Science and Engineering students at all levels.
- (v) The gap between those individuals in a society who is computer literate and has access to information resources like the Internet and those who do not, is referred to as the digital divider.

25. Major Initiatives in India for providing E-Content for Different Courses

The key initiatives taken by the government are SWAYAM, SWAYAM Prabha, National Digital Library, e-Shodh Sindhu, FOSSEE and Virtual Lab.

Swayam:

With the use of ICT, SWAYAM is designed to provide one integrated platform and portal for online courses to cover all higher education subjects and skill sector courses.

Swayam Prabha:

As one of the key initiatives by the government, SWAYAM Prabha is designed to provide 32 high quality educational channels through DTH (Direct to Home) across the length and breadth of the country on 24X7 basis.

National Digital Library (NDL):

It is another initiative of the government to develop a framework of virtual repository of learning resources with a single-window search facility. So far, about 1.5 crore e-books and documents are available on NDL.

e-Shodh Sindhu:

This project of the government aims at providing access to quality electronic resources including full-text, bibliographic and factual databases to academic institutions at a lower rates of subscription. The MHRD has designed this project by merging three consortia initiatives such as UGC-INFONET Digital Library Consortium, NLIST and INDEST-AICTE Consortium.

Fossee:

Designed by the MHRD, the Free and Open Source Software for Education (FOSSEE) project aims at promoting use of open source software in educational institutions to improve the quality of education.

Virtual Lab:

The Virtual Lab aims at providing remote-access to laboratories in various disciplines of Science and Engineering for students at all levels from under-graduate to research.

26. Key Challenges in ICT Adoption in Indian Universities

There are several challenges to adopt ICT in Indian universities in higher education; they are:

- (i) lack of knowledge
- (ii) pace of change
- (iii) funding
- (iv) changing roles and norms
- (v) sustainability and scale etc.

Sub Unit – 4

Data and Governance

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27. Introduction

- (i) **Electronic governance** or **e-governance** is the application of ICT for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and services between government-to-citizen, government-to-business, government-to-government, government-to-employees as well as back-office processes and interactions within the entire government framework.
- (ii) Through e-governance, government services are made available to citizens.
- (iii) The three main target groups that can be distinguished in governance concepts are government, citizens, and businesses/interest groups.

28. E-Governance in India

- (i) E-Governance is basically associated with carrying out the functions and achieving the results of governance through the utilization of ICT.
- (ii) Governance relates to safeguarding the legal rights of all citizens and the benefits of economic growth to all.
- (iii) It also ensures government to be transparent in its dealings, accountable for its activities and faster in its responses as part of good governance.
- (iv) However, this would require the government to change itself – its processes, outlook, laws, rules and regulations and also its way of interacting with the citizens.

29. Recent Initiatives

Types of Government Interaction in e-governance are Government to Government, Government to Citizen, Government to Business and Government to Employee.

30. Central Government Initiatives

- (i) **E-Office:** e-Office is aimed at increasing the usage of work flow and rule based file routing, quick search and retrieval of files and office orders, digital signatures for authentication, forms and reporting components.
- (ii) **Immigration, Visa and Foreigner's Registration & Tracking (IVFRT):** India has emerged as a key tourist destination, besides being a major business and service hub. Immigration Check Post is the first point of contact that generates public and popular perception about the country.
- (iii) **UID:** The unique identification project was conceived as an initiative that would provide identification for each resident across the country.
- (iv) **Pensions:** The pensions are primarily aimed at making the pension/ retirement related information handling mechanism accessible online to the pensioners, through a combination of interactive and non-interactive components.
- (v) **Banking:** It is yet another step towards improving operational efficiency and reducing the delays and efforts in handling and settling transactions.
- (vi) **Posts:** Postal Services have been undertaken by the Department of Posts through computerization and networking of all post offices using a central server-based system.

31. State Government Initiatives

- (i) **E-Governance in Municipalities:** It is an initiative of the Government of India conceptualized under the umbrella of the overall National e-Governance Plan and the Jawaharlal Nehru National Urban Renewal Mission aimed at improving operational efficiencies within Urban Local Bodies.

- (ii) **Crime and Criminal Tracking Network & Systems:** It aims at creating a comprehensive and integrated system for enhancing the efficiency and effective policing at all levels and creation of a nationwide networked infrastructure for evolution of IT-enabled state-of-the-art tracking system.
- (iii) **Public Distribution System:** Computerization of the PDS is envisaged as an end-to-end project covering key functional areas such as supply chain management including allocation and utilization reporting, storage and movement of food grains, grievance redressal and transparency portal, digitization of beneficiary database, Fair Price Shop automation, etc.
- (iv) **Health:** ICT for programme management has been undertaken by the Ministry of Health & Family Welfare in the Mother and Child Tracking System, Hospital Information Systems, supply chain management for drugs and vaccines, providing ICT tools to ASHA and ANM workers.
- (v) **E-Panchayat:** While some computerization efforts for Panchayati Raj Institutions (PRIs) have been made by NIC, the e-Governance has not touched the PRIs yet in significant measure. The Ministry of Panchayati Raj has therefore decided to take up the computerization of PRIs on a mission mode basis.
- (vi) **E-District:** e-District is one of the Mission Mode Projects under National e Governance Plan (NeGP). This project aims at providing support to the District Administration.
- (vii) **National Land Records Modernization Programme (NLRMP):** A Project for Computerization of Land Records (CLR) was launched in 1988-89. In 1997-98, the scheme was extended to tehsils to start distribution of Records of Rights to landowners on demand.

32. Advantage of E-Governance

Following are the advantages of E-Governance.

- (i) Speed:** Technology makes communication speedier. Internet, Phones, Cell Phones have reduced the time taken in normal communication.
- (ii) Cost Reduction:** Most of the Government expenditure is appropriated towards the cost of stationary. Paper-based communication needs lots of stationary, printers, computers, etc. which calls for continuous heavy expenditure. Internet and Phones makes communication cheaper saving valuable money for the Government.
- (iii) Transparency:** Use of ICT makes governing process transparent. All the information of the Government would be made available on the internet. The citizens can see the information whenever they want to see. But this is only possible when every piece of information of the Government is uploaded on the internet and is available for the public.
- (iv) Accountability:** Once the governing process is made transparent the Government is automatically made accountable. Accountability is answerability of the Government to the people. It is the answerability for the deeds of the Government. An accountable Government is a responsible Government.

33. Problem of Implementing E-Governance in India

- (i) Loss of Interpersonal Communication:** The main disadvantage of e-governance is the loss of interpersonal communication. Interpersonal communication is an aspect of communication that many people consider vital.
- (ii) High Setup Cost and Technical Difficulties:** Technology has its disadvantages as well. Specifically, the setup cost is very high and machines have to be regularly maintained. Often, computers and internet can also break down and put a dent in governmental work and services.

- (iii) **Illiteracy:** A large number of people in India are illiterate and do not know how to operate computers and smartphones. E-governance is very difficult for them to access and understand.
- (iv) **Cybercrime/Leakage of Personal Information:** There is always the risk of private data of citizens stored in government servers being stolen. Cybercrime is a serious issue; a breach of data can make the public lose confidence in the Government's ability to govern the people.