IBPS IT OFFICER SCALE – I

PROFESSIONAL STUDIES

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SPECIAL RELEASE " AVASA THE INDEPENDENT "

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for their great contribution towards study materials for IT Officer Scale I

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IBPS Specialist officer exam 2014 – Syllabus, Pattern and Question papers

A Study Material for all IBPS SO Exam aspirants

Institute of Banking Personnel Selection (IBPS) is conducting Common Written Examination for Specialist Officers Phase III (CWE SPL-III) for selecting the candidates for the following posts in participating banks

I.T. Officer (Scale-I and Scale II)
Agricultural Field Officer (Scale I)
Rajbhasha Adhikari (Scale I)
Law Officer (Scale I and Scale II)
HR/Personnel Officer (Scale I)
Marketing Officer (Scale I)
Chartered Accountant (Scale II)
Manager Credit (Scale II)/ Finance Executive (Scale II)

Eligibility Criteria for IBPS SO Examination

In general, the candidates should have bacheolors degree in the respective subject for applying for the posts. Candidates with work experience can apply for Scale II posts wherever available. For detailed eligibility requirements visit the IBPS SO examination advertisement at http://www.ibps.in/career_pdf/Draft_ad_Specialist_Officers_III.pdf

Pattern of Question papers for IBPS SO examination

Total number of questions – 200
Total marks – 200
Time for completing the examination – 2 hours

Main subjects and distribution of marks for IBPS SO examination

For Law Officer (scale 1 and Scale 2) and Rajbhasha Adhikari (scale 1)

Reasoning – 50 Questions 50 Marks
English Language – 50 Questions 25 Marks
General Awareness or Knowledge (special focus on Banking Industry)- – 50 Questions 50 Marks
Professional Knowledge– 50 Questions 75 Marks

For IT Officer (Scale 1 & 2), Agricultural Field officer (scale 1), HR/Personnel Officer (scale 1), Marketing officer (Scale 1), Technical Officer (scale 1), Chartered Accountant (scale 2) and Finance Executive (scale 2)

Reasoning – 50 Questions 50 Marks
English Language – 50 Questions 25 Marks
Quantitative Aptitude – 50 Questions 50 Marks
Professional Knowledge – 50 Questions 75 Marks

- **Negative Marking Scheme for IBPS SO Examination**
  For each question for which a wrong answer has been given by the candidate one fourth or 0.25 of the marks assigned to that question will be deducted as a negative mark. If a question is left blank, there will be no penalty for that question.

IBPS SO Exam Syllabus

IBPS SO Syllabus for English Language:

Reading comprehension, fill in the blanks, sentence corrections, Para jumbles, Vocabulary, Grammar Corrections, Identification of Errors, sentence corrections, Vocabulary, Grammar Corrections, Identification Of Errors, Synonyms/ Antonyms, Choosing the appropriate word and Spelling Check questions

Reasoning Syllabus for IBPS SO exam:

Questions are asked from both Verbal and Non Verbal reasoning. In verbal reasoning – Completing number and alphabetical series, Coding and decoding, relations and ranking, Simple arithmetical reasoning, Analogies / decision making, Classification, odd one out, time sequence test, analytical reasoning, directions/distance sense test, input /output /seating arrangements etc.
In non verbal reasoning – series completion, finding missing figures, Mirror Images etc.

Quantitative Aptitude Syllabus for IBPS Specialist officer exam:

Number system, decimal fractions, Ratio and proportions, Percentage, Time and distance, Time and work, Speed and Distance, Profit and loss, Average, Simple and compound interest, Data Interpretation and sufficiency includes Data Tables, Charts and Graphs, and Probability

Professional Knowledge syllabus for Specialist Officer examination

IBPS Specialist officer examination is having 50 questions from the professional knowledge of the candidate based on the post they are applied for. Expect questions in graduation level, a good reference of text books in your degree class with some current affairs on the subject will make things easy. The following areas are considered important based on the previous year examinations.

IBPS IT officer syllabus for professional knowledge:

C Prgramming Basics, MS Office, Windows OS and Programming, DBMS, Data Communication & Networking , Network Security, Web Technologies, Basic Programming concepts, Basics of hardware (Microprocessor, timer, ALU etc.), Software Engineering

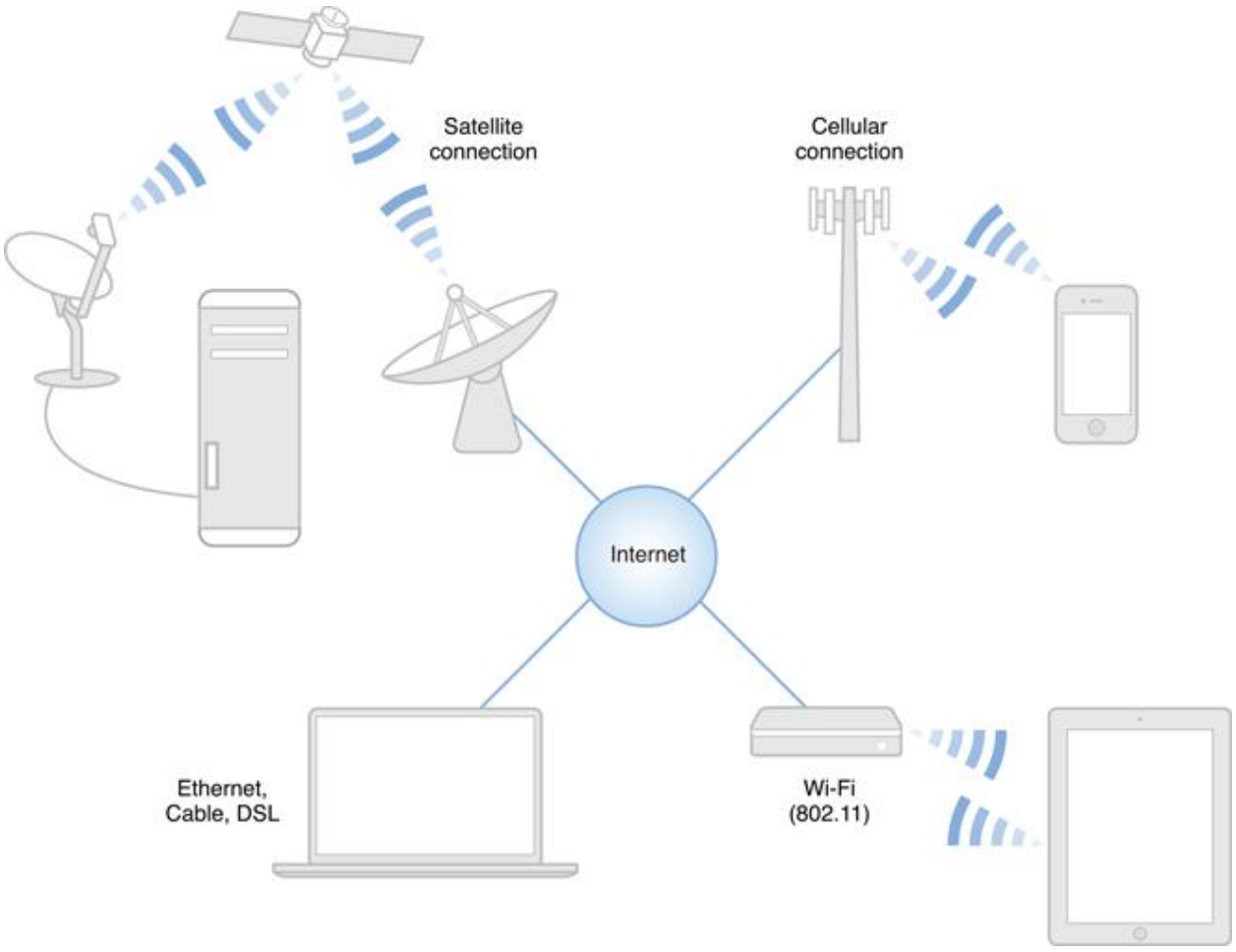
Notes:

Here in study Material We are providing only Professional Knowledge of IT Officer and for others you may take help from any of the good Publication.

DATA COMMUNICATION AND NETWORKING

NETWORKING:

The world of networking is complex. Users can connect to the Internet using a wide range of technologies—cable modems, DSL, Wi-Fi, cellular connections, satellite uplinks, Ethernet, and even traditional acoustic modems. Each of these connections has distinct characteristics, including differences in bandwidth, latency, packet loss, and reliability



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To add further complexity, the user's connection to the Internet does not tell the whole story. On its way from the user to an Internet server, the user's network data passes through anywhere from one to dozens of physical interconnects, any one of which could be a high-speed OC-768 line (at almost 40 billion bits per second), a meager 300 baud modem (at 300 bits per second), or anything in-between. Worse, at any moment, the speed of the user's connection to a server could change drastically—someone could turn on a microwave oven that interferes with the user's Wi-Fi communications, the user could walk or drive out of cellular range, someone on the other side of the world could start downloading a large movie from the server that the user is trying to access, and so on.

As a developer of network-based software, your code must be able to adapt to changing network conditions, including performance, availability, and reliability. This document tells you how.

At a Glance

Networks are inherently unreliable—cellular networks doubly so. As a result, good networking code tends to be somewhat complex. Among other things, your software should:

- Transfer only as much data as required to accomplish a task. Minimizing the amount of data sent and received prolongs battery life, and may reduce the cost for users on metered Internet connections that bill by the megabyte.
- Avoid timeouts whenever possible. You probably don't want a webpage to stop loading just because the loading process took too long. Instead, provide a way for the user to cancel the operation.

In certain rare situations, data becomes irrelevant if delayed substantially. In these situations, it may make sense to use a protocol that does not retransmit packets. For example, if you are writing a real-time multiplayer game that sends tiny state messages to another device over a local area network (LAN) or Bluetooth, it is often better to miss a message and make assumptions about what is happening on the other device than to allow the operating system to queue those packets and deliver them all at once. For most purposes, however, unless you have to maintain compatibility with existing protocols, you should generally use TCP.

- Design user interfaces that allow the user to easily cancel transactions that are taking too long to complete. If your app performs downloads of potentially large files, you should also provide a way to pause those downloads and resume them later.
- Handle failures gracefully. A connection might fail for any number of reasons—the network might be unavailable, a hostname might not resolve successfully, and so on. When failures occur, your program should continue to function to the maximum degree possible in an offline state.

To add further complexity, sometimes a user may have access to resources only while on certain networks. For example, AirPlay can connect to an Apple TV only while on the same network. Corporate network resources can be accessed only while at work or over a virtual private network (VPN). Visual Voicemail may be accessible only over the cellular carrier's network (depending on the carrier). And so on.

In particular, you should avoid interfaces that require the user to babysit your program when the network is malfunctioning. Don't display modal dialogs to tell the user that the network is down. Do retry automatically when the network is working again. Don't alert the user to connection failures that the user did not initiate.

- Degrade gracefully when network performance is slow. Because the bandwidth between your device and your ISP is limited, you can reach other devices on your home network much more quickly than servers on the other side of the world. This difference becomes even greater when someone else on your local network starts using that limited bandwidth for other purposes.
- Choose APIs that are appropriate for the task. If there is a high-level API that can meet your needs, use it instead of rolling your own implementation using low-level APIs. If there is an API specific to what you are doing (such as a game-centric API), use it.

By using the highest-level API, you are providing the operating system with more information about what you are actually trying to accomplish so that it can more optimally handle your request. These higher-level APIs also solve many of the most complex and difficult networking problems for you—caching, proxies, choosing from

among multiple IP addresses for a host, and so on. If you write your own low-level code to perform the same tasks, you have to handle that complexity yourself (and debug and maintain the code in question).

- Design your software carefully to minimize security risks and to correctly take advantage of security technologies that are available, such as Secure Sockets Layer (SSL) and Transport Layer Security (TLS).

Learn Why Networking Is Hard

Although writing networking code can be easy, for all but the most trivial networking needs, writing *good* networking code is not. Depending on your software's needs, it may need to adapt to changing network performance, dropped network connections, connection failures, and other problems caused by the inherent unreliability of the Internet itself.

OS X and iOS Provide APIs at Many Levels

You can accomplish the following networking tasks in both OS X and iOS with identical or nearly identical code:

- Perform HTTP/HTTPS requests, such as GET and POST requests
- Establish a connection to a remote host, with or without encryption or authentication
- Listen for incoming connections
- Send and receive data with connectionless protocols
- Publish, browse, and resolve network services with Bonjour

Secure Communication Is Your Responsibility

Proper networking security is a necessity. You should treat all data sent by your user as confidential and protect it accordingly. In particular, you should encrypt it during transit and protect against sending it to the wrong person or server.

Most OS X and iOS networking APIs provide easy integration with TLS for this purpose. TLS is the successor to the SSL protocol. In addition to encrypting data over the wire, TLS authenticates a server with a certificate to prevent spoofing.

Your server should also take steps to authenticate the client. This authentication could be as simple as a password or as complex as a hardware authentication token, depending on your needs.

Be wary of all incoming data. Any data received from an untrusted source may be a malicious attack. Your app should carefully inspect incoming data and immediately discard anything that looks suspicious.

iOS and OS X Offer Platform-Specific Features

The networking environment on OS X is highly configurable and extensible. The System Configuration framework provides APIs for determining and setting the current network configuration. Additionally, network kernel extensions enable you to extend the core networking infrastructure of OS X by adding features such as a firewall or VPN.

On iOS, you can use platform-specific networking APIs to handle authentication for captive networks and to designate Voice over Internet Protocol (VoIP) network streams.

Networking Must Be Dynamic and Asynchronous

A device's network environment can change at a moment's notice. There are a number of simple (yet devastating) networking mistakes that can adversely affect your app's performance and usability, such as executing synchronous networking code on your program's main thread, failing to handle network changes gracefully, and so on. You can save a lot of time and effort by designing your program to avoid these issues to begin with instead of debugging it later.

The Famous, Overrated But Useful 7-Layer Model
Every network textbook includes a picture of the famous "seven-layer" model. Actually, this model is vague, and it does not always correspond to specific portions of specific networks. Nevertheless, it serves as a useful overview of the field. Here is how some of the layers relate to our sample network above.

Overview of the Layers
The layers collectively are often referred to as the protocol stack.

Physical Layer
This is concerned with the nature of the physical media (metal or optical cable, free-space microwave, etc.) used to send signals, the nature of the signals themselves, and so on. There is also the question of signal form; the signals themselves may be in the form of pure 0-1 bits, or may be in the form of certain frequencies. In addition there are questions concerning how a receiver distinguishes two bits which are adjacent in time.
A major issue is the form of the medium, both in terms of the materials it uses and its topology. A basic wired Ethernet, for example, consists of cable conducting electrical signals; the connections could also be wireless. More complicated networks, including Ethernets, may consist of more than one cable, with all of them connected via a hub. The latter has become common even at the household level.

Data Link Layer
For example, in an Ethernet, this layer is concerned with ensuring that two network stations connected to the same cable do not try to access the line at the same time.4 For this reason the Ethernet operation is an example of what is called a Medium Access Control (MAC) Protocol.Here is an overview of how the Ethernet MAC protocol works, using a "listen before talk" approach. When a network node has a message ready to send, it first senses the cable to see if any node is currently sending. If so, it generates a random backoff time, waiting this amount of time before trying again. If the node does not "hear" any other node sending, it will go ahead and send. There is a small chance that another node actually had been sending but due to signal propagation delay the transmission had not yet reached the first node. In that case a collision will occur, destroying both messages. Both nodes will sense the collision, and again wait random amounts of time before trying again. This layer also does the setting up of frames of bits (i.e. sets of consecutive bits sent along the wire), which not only include the message itself but also information such as (say, in the Ethernet case) the Ethernet ID number of the destination machine. Messages may be broken up into pieces before being sent. This may be handled at the transport level (see below), but may also be done at the data link level.

Network Layer
This is the routing layer. Questions addressed in this layer include: If in our example above saturn wants to send a message to holstein, how is that accomplished? Obviously its first step is to send the message to *mars*; how does saturn know this? How can alternate routes be found if traffic congestion occurs?

Transport Layer
Suppose saturn's message to holstein consists of a large file transfer, say 100 megabytes. This transfer will take a long time (by network standards), and we certainly don't want it to monopolize the network during that time. We also must deal with the fact that the buffer space at holstein won't be large enough to deal with a 100-megabyte message. Also, one 100-megabyte message would have a sizable probability of having at least one bit in error, and if so, we would have to retransmit the entire message! So, the file transfer must be done in pieces. But we don't want to burden the user at saturn with the task of breaking up the 100 megabytes into pieces, nor do we want to burden the user at holstein with the reassembly of the messages.7 Instead, the network software (again, typically in the OS) should provide these services, which it does at the transport layer, as for example is the case with TCP.

Session Layer

This layer is concerned with management of a session, i.e. the duration of a connection between two network nodes. The word *connection* here does not mean something physical, but rather refers to an agreement between two nodes that some chunks of data with some relation to each other will be exchanged for some time. Actually, TCP does this in some senses, as does the socket interface to TCP, which is very much like the interfaces for reading or writing a file (described in more detail later).

Presentation Layer

This layer deals with such matters as translating between character codes, if the source uses one and the destination the other. In the old days, this could mean ASCII at one end and EBCDIC on the other end. Today, though, it could mean for example two different coding systems for Chinese characters, Big 5 and GB.

Application Layer

You can write programs at the application layer yourself, and of course you use many programs written by others, such as ftp, Web browsers, e-mail utilities, and so on.

How the Layers Interact

The Physical Layer is obviously implemented in hardware. So is the Data Layer, in the sense that the NIC will handle this layer and is hardware.8 These days the Network Layer is also usually hardware; as noted above, Ethernet hubs are now common in the home, and include routing capabilities. The Transport Layer and above are usually implemented in software, actually as part of the OS. Information is communicated from one layer to the next.9 For instance, think of the file-transfer example presented earlier. The file-transfer program, say ftp, works in the Application Layer. It will call socket service functions in the Session Layer, such as the socket() function, which opens a network connection in a manner very similar to the open() function which opens a file. These functions will in turn call functions for TCP operations in the Transport Layer, which will themselves call functions for IP operations at the Network layer. The latter will then—say we are on an Ethernet—issue machine instructions (e.g. IN and OUT in the case of Intel CPUs) to the Ethernet NIC, which will use the Data Link and Physical Layers to put frames out onto the LAN. At any given layer, a function passes the message in a packet of bits to the next lower layer. The packet grows larger at each layer, because each layer adds more information. Say we are using the put command in ftp to copy a file named zyx to the destination machine. When we do this, ftp calls the write() function to send data,10 A typical call to write() will contain the actual data to be transferred, in this case part of zyx. At this point the packet consists only of the data, the socket number and the number of bytes of data, and will be handed over to TCP.

TCP will then add to the frame the TCP source and destination port numbers, packet sequence numbers (when a long message is being sent in small pieces, each piece gets a sequence number to identify it), and so on, and then pass the packet to IP.

IP will add to the packet a code indicating the fact that this is a TCP packet (as opposed to UDP, another type of communication service offered in the TCP/IP protocol), plus the source and destination IP addresses, and so on, and pass the packet to the NIC.

In for example the Ethernet case, the NIC will then add to the packet the source and destination Ethernet addresses, a code indicating that this message uses the TCP/IP protocol suite. The packets sent at the physical level have a special name, frames. When a frame reaches the destination machine, a mirror image of the above process occurs. The packet will now travel up the protocol stack, and will shrink as it does so. In the ftp example, the "top" of the stack will be ftpd, which is the "partner" program of ftp running on the destination machine. Note also that as the packet gets routed through intermediate machines on its way to the destination, at each of these intermediate machines it will travel up the protocol stack to the Network Layer (i.e. IP), which will check to see whether it has reached the destination, and then upon finding that it hasn't, it will be sent back down the stack for transmission to the next machine in its path to the destination.

More on TCP/IP

TCP/IP is a very complex system, the subject of numerous thick books, and we cannot go into detail on it in this document. We will give only a short introduction.

TCP/IP Overview

A famous and very common network protocol is TCP/IP. It was originally invented as part of the UNIX OS, and later became the basis for the Internet (the Internet was developed mainly on UNIX machines). For the latter reason, it is now part of other OSs, such as Windows TCP/IP actually includes two protocols at the transport level, TCP and UDP, and one at the network level,
IP.

TCP

TCP is a **connection-oriented** protocol. As mentioned earlier, the term *connection* does not refer to a physical connection, but rather to a temporary agreement set up between the source and destination nodes concerning the processing of a sequence of ordered packets, such as the sizes of the pieces of a file sent during a file transfer. The TCP Layer at the destination end will:

- let the TCP Layer at the source know how many packets the destination currently has room for
- watch for the packets
- piece them together as they arrive, possibly out of order (again, to reassemble them properly, we use the sequence numbers within the packets)
- send acknowledgement messages to the source node as packets arrive

The destination will also look at the error-checking bits in each package, and will give negative acknowledgements if errors are detected. If the source does not receive an acknowledgement for a given packet within a preset amount of time, it will **time out** and resend the packet. It will also do so if it receives a negative acknowledgement for a packet. For this reason, TCP is called a **reliable** protocol (though this term should not be taken to mean "100% reliable").

UDP

UDP, on the other hand, is **connectionless** and **unreliable**. UDP is pretty reliable if confined to a LAN, but problems may occur elsewhere, because for example a buffer at a router might be full and the **datagram** (the term used instead of *packet* in the UDP case) is dropped. UDP's virtue is that it is simple and thus has very little overhead, compared to TCP, which spends a lot of time negotiating and maintaining a connection between the source and destination nodes. UDP is useful in applications in which we can afford to lose some messages, such as a time server, whichbroadcasts time of day to client machines; if a client misses one message this is no problem, as it will pick
up the next one. Thus the unreliability of UDP is not a problem, and the low overhead of UDP is a virtue.
Similarly, suppose we are broadcasting a graphics animation or a movie over a network. Loss of one message would result in nothing more than a tiny "blip" on the screen, barely noticeable to the viewer, so again reliability is not an issue. Moreover, in **real-time** applications like this, we can hardly afford the delay caused by retransmitting when messages are lost or corrupted, which is what TCP would do.
Also, UDP is capable of **broadcasting**, i.e. sending out just one copy of a message to all machines connected to the same Ethernet. If we do wish to send the same message to everyone, the ability to do so using just one copy can really help reduce traffic on the network.

IP Addresses

Each node on the Internet has an **IP address**, a 32-bit number.13 Usually this is written for human consumption as four numbers, specifically the values in each of the four bytes of the address. The IP address of the machine **garnacha.engr.ucdavis.edu**, for instance, is 169.237.126.236.14 When TCP or UDP passes a packet to IP, the latter will determine where it should be sent in order to ultimately reach its proper destination. For instance, if the machine has two NICs, IP must decide which one to pass the packet to.

Peer Communication

An application program using TCP or UDP will be communicating with its **peer** using TCP or UDP on the remote machine. Typically one of these programs will be a service provider and thus is termed the **server**, and the other will be the service requester, called the **client**. For instance, when you use the **ftp** program, it is a client, and the server is the **ftpd** program ("ftp daemon") running on the remote machine. For the application programmer, it would be extremely inconvenient to have to code the actual packet formation. Thus it would be nice to provide functions which access TCP and IP from a somewhat higher level. One popular type of such functions is **sockets**, which to the programmer look very similar to file handles. Again the sockets form peer relationships with each other. Consider **ftp** again, for instance, with a **put** operation. On your end, **ftp** writes data to its socket, and at the destination machine **ftpd** will read from its socket.The two sockets were associated with each other at the time they were created. Similarly, the TCP
layer on your machine will think of itself communicating with the TCP layer at the destination machine.

Viewing Current Socket Status
On UNIX machines, the **netstat** command will show you the current status of all open sockets; there is a version on Microsoft Windows machines too.
Next time you are on a UNIX machine, run the **netstat** command twice, once before and once during an ftp

What Makes a Connection Unique
Several socket programs might be running concurrently on the same machine. They may even all be accepting messages from the same remote machine. So, when a message arrives, how can the OS tell which program it should be routed to? The answer is that different socket programs are distinguished by their **port** numbers. The **ftpd** service is on port 21, for instance. A communication between two machines must be defined by five pieces of information:

- protocol (TCP, UDP, etc.)
- server IP address
- server socket port number
- client IP address
- client (ephemeral) socket port number

The server, for example, may be involved in several TCP transactions sent from the same machine, and thus the server needs to have some way of distinguishing between them. And similarly, when the server sends messages back to a client, the TCP system at the client's machine has to have some way of determining which program the server's message is intended for.

Say for example, there are two users currently on machine X, one using **ftp** to port 21 at machine Y, and another using **telnet** to port 23 at machine Z. But the programs being run by the two users will also have **ephemeral** ports at their own machines, say 2592 and 5009, temporarily assigned to them by the TCP system at machine X. The **ftp** program will inform the FTP server at machine Y about this 2592 number when it first connects to Y, and when the server sends back to X it will use this number. The TCP system at X will see this number, and route the message to the **ftp** program accordingly. Similar statements hold for **telnet**, etc. And even if the two users had both been using **ftp**, their two different ephemeral port numbers would distinguish them from each other.

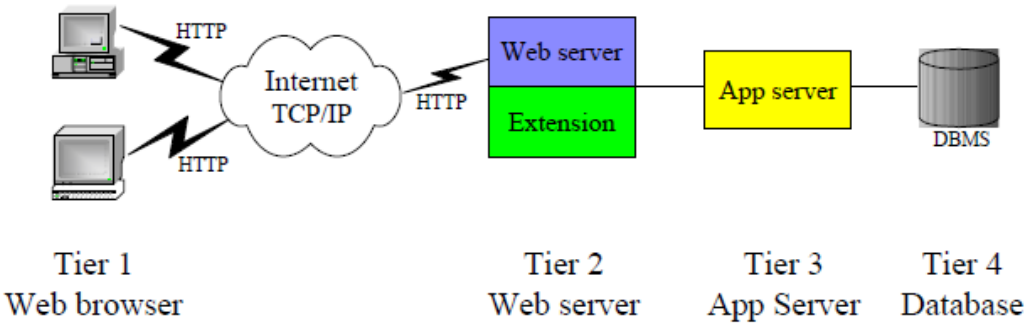
WEB TECHNOLOGIES

Concepts

Web servers and web browsers are communicating client-server computer programs for distributing documents and information, generally called web data, over the Internet. Web data are marked up in the HTML language for presentation and interaction with people in web browsers. Each web server uses an IP address or domain name as well as a port number for its identification. People use web browsers to send data requests to web servers with the HTTP protocol, and the web servers running on server computers either retrieve the requested data from local disks or generate the data on-the-fly, mark up the data in HTML, and send the resulting HTML files back to the web browsers to render. *Apache*, *Tomcat* and *IIS* are popular web server programs, and *IE* and *Firefox* are popular web browsers.

Web Architecture

A typical web application involves four tiers as depicted in the following web architecture figure: web browsers on the client side for rendering data presentation coded in HTML, a web server program that generates data presentation, an application server program that computes business logic, and a database server program that provides data persistency. The three types of server programs may run on the same or different server machines.



Web browsers can run on most operating systems with limited hardware or software requirement. They are the graphic user interface for the clients to interact with web applications. The basic functions of a web browser include:

- Interpret HTML markup and present documents visually;
- Support hyperlinks in HTML documents so the clicking on such a hyperlink can lead to the corresponding HTML file being downloaded from the same or another web server and presented;
- Use HTML form and the HTTP protocol to send requests and data to web applications and download HTML documents;
- Maintain cookies (name value pairs, explained later) deposited on client computers by a web application and send all cookies back to a web site if they are deposited by the web application at that web site (cookies will be further discussed later in this chapter);
- Use plug-in applications to support extra functions like playing audio-video files and running Java applets;
- Implement a *web browser sandbox* security policy: any software component (applets, JavaScripts, ActiveX, …) running inside a web browser normally cannot access local clients' resources like files or keyboards, and can only communicate directly with applications on the web server from where it is downloaded.

The web server is mainly for receiving document requests and data submission from web browsers through the HTTP protocol on top of the Internet's TCP/IP layer. The main function of the web server is to feed HTML files to the web browsers. If the client is requesting a static existing file, it will be retrieved on a server hard disk and sent back to the web browser right away. If the client needs customized HTML pages like the client's bank

statement, a software component, like a JSP page or a servlet class (the "Extension" box in the web architecture figure), needs to retrieve the client's data from the database and compose a response HTML file on-the-fly. The application server is responsible for computing the business logics of the web application, like carrying out a bank account fund transfer and computing the shortest route to drive from one city to another. If the business logic is simple or the web application is only used by a small group of clients, the application server is usually missing and business logics are computed in the web server extensions (PHP, JSP or servlet, …). But for a popular web application that generates significant computation load for serving each client, the application server will take advantage of a separate hardware server machine to run business logics more efficiently. This is a good application of the divide-and-conquer problemsolving methodology.

Uniform Resource Locators (URL)

A web server program runs multiple web applications (sites) hosted in different folders under the web server program's document root folder. A server computer may run multiple server programs including web servers. Each server program on a server computer uses a port number, between 0 and 65535, unique on the server machine as its local identification (by default a web server uses port 80). Each server computer has an IP address, like 198.105.44.27, as its unique identifier on the Internet. Domain names, like www.pace.edu, are used as user-friendly identifications of server computers, and they are mapped to IP addresses by a Domain Name Server (DNS). A Uniform Resource Locator (URL) is an address for uniquely identifying a web resource (like a web page or a Java object) on the Internet, and it has the following general format:

http://domain-name:port/application/resource?query-string

where *http* is the protocol for accessing the resource (*https* and *ftp* are popular alternative protocols standing for *secure HTTP* and *File Transfer Protocol*); *application* is a server-side folder containing all resources related to a web application; *resource* could be the name (alias or nickname) of an HTML or script/program file residing on a server hard disk; and the optional query string passes user data to the web server.

An example URL is http://www.amazon.com/computer/sale?model=dell610.

There is a special domain name "localhost" that is normally defined as an alias of local IP address 127.0.0.1. Domain name "localhost" and IP address 127.0.0.1 are for addressing a local computer, very useful for testing web applications where the web browser and the web server are running on the same computer.
Most computers are on the Internet as well as on a local area network (LAN), like home wireless network, and they have an external IP address and a local IP address. To find out what is your computer's external IP address on the Internet, use a web browser to visit http://whatismyip.com. To find out what is your local (home) IP address, on Windows, run "ipconfig" in a DOS window; and on Linux, run "sudoifconfig" in a terminal window.

HTML Basics

HTML is a markup language. An HTML document is basically a text document marked up with instructions as to document logical structure and document presentation. The following is the contents of file "~/tomcat/webapps/demo/echoPost.html" in the *ubuntu10* VM.

```
<html>
<head>
<body>
<form method="post" action="http://localhost:8080/demo/echo">
Enter your name: <input type="text" name="user"/> <br/><br/>
<input type="submit" value="Submit"/>
```

<input type="reset" value="Reset"/>
</form>
</body>
</html>

An HTML *tag name* is a predefined keyword, like html, body, head, title, p, and b, all in lower-case. A tag name is used in the form of a *start tag* or an *end tag*. A start tag is a tag name enclosed in angle brackets < and >, like <html> and . An end tag is the same as the corresponding start tag except it has a forward slash / immediately before the tag name, like </html> and .

An *element* consists of a start tag and a matching end tag based on the same tag name, with optional text or other elements, called *element value*, in between them.

The following are some element examples:

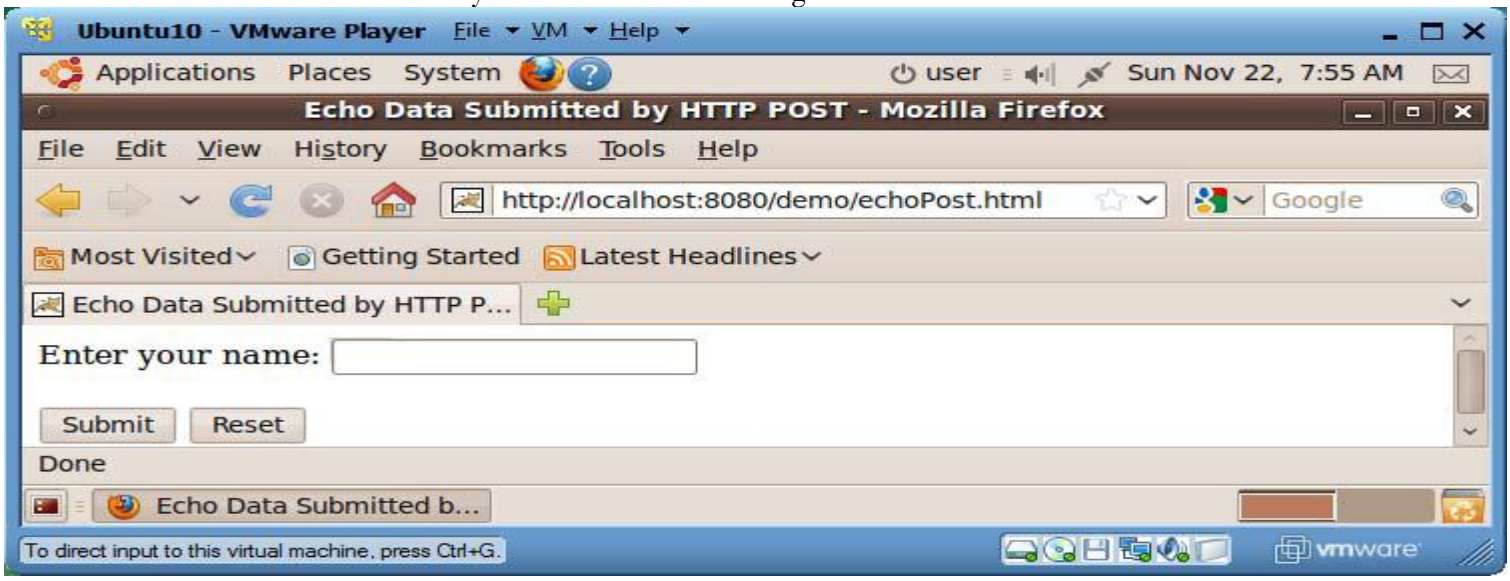
* This is free text *
* This element has a nested element *

While the elements can be nested, they cannot be partially nested: the end tag of an element must come after the end tags of all of its nested elements (*first starting last ending*). The following example is not a valid element because it violates the above rule:

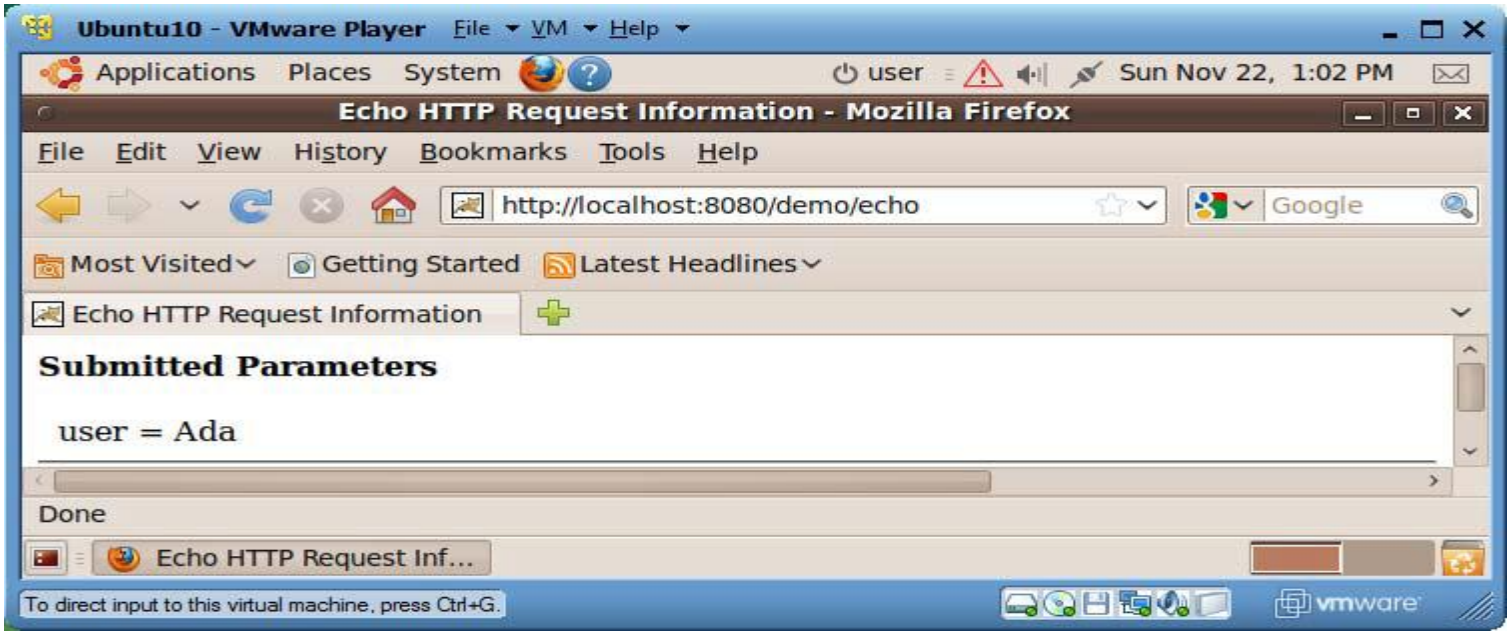
* This is not a valid <bold>element <bold>*

The *newline* character, the *tab* character and the *space* character are collectively called the *white-space characters*. A sequence of white-space characters acts like a single space for web browser's data presentation. Therefore, in normal situations, HTML document's formatting is not important (it will not change its presentation in web browsers) as long as you don't remove all white-space characters between successive words.
If an element contains no value, the start tag and the end tag can be combined into a single one as <tagName/>. As an example, we use <br/> to insert a line break in HTML documents. The start tag of an element may contain one or more *attributes*, each in the form "*attributeName="attributeValue*"". The above form element has two attributes: method and action.

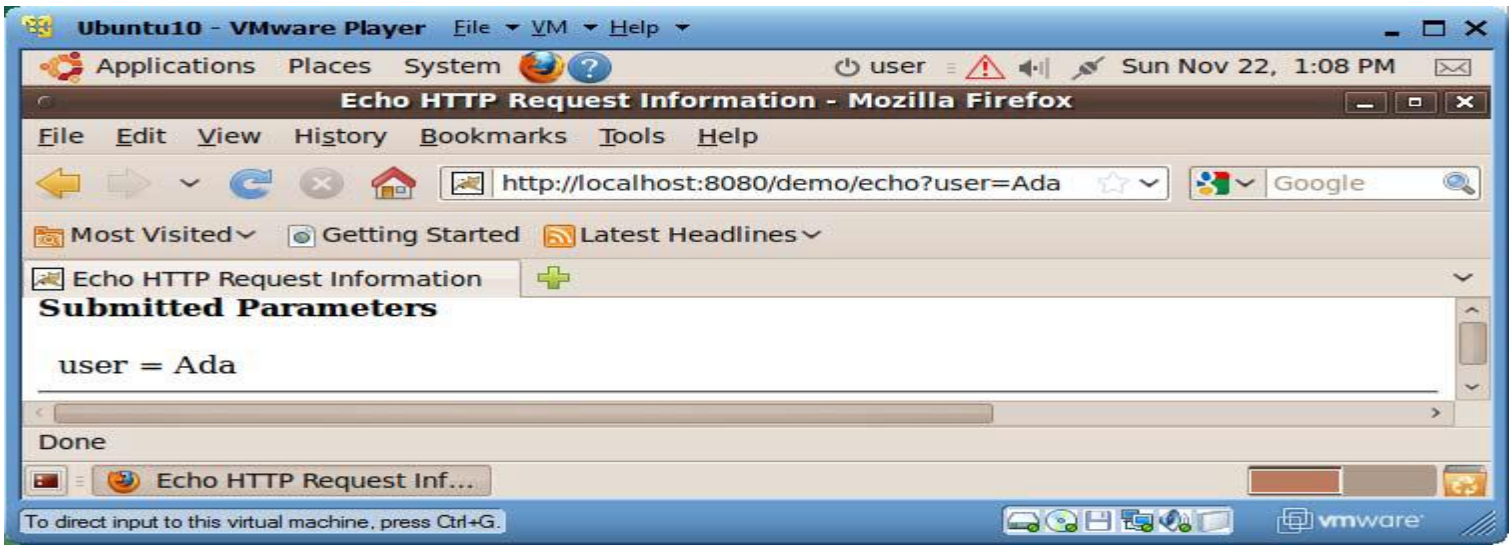
An HTML document must contain exactly one top-level html element, which in turn contains exactly one body element. Most of the other contents are nested in the body element. If you load the above file "echoPost.html" in a web browser you will see the following:



The form element is the most important mechanism for interaction between people and web applications. A form typically contains a few input elements and at least one submit button. A form element usually has two attributes: the method attribute for specifying HTTP method for submitting the form data to the web application (only values normally used are "get" and "post"); and the action attribute for specifying the form data submission destination, or the URL of a web application. In this example, when people click on the submit button, the form data will be sent to resource "echo" of the same web application "demo" deployed on your Ubuntu VM's Tomcat web server, which will echo back all information the web browser sent to the web server. If the action value doesn't specify the domain name/IP address or the web application, then the web application from where this HTML file came from will receive the form data. The first input element of type "text" has been rendered as a text field, the second input element of type "submit" has been rendered as a submit button, and the third input element of type "reset" has been rendered as a reset button. The value attribute of the input elements determines what string will be displayed on the element's image. The name attribute of the input element specifies the variable name with which web server programs can access what people type/enter in the element. When the submit button is clicked, the form data will be packaged as an HTTP request and sent to the web resource specified by the action attribute with the method specified by the method attribute. If you type "Ada" in the name filed and click on the submit button, you will receive the HTTP response partially displayed below



basically the same except the method attribute for the form is changed from "post" to "get". If you enter "Ada" in the name field and click on the submit button again, you will notice that the query string "?user=Ada" has been appended to the end of the URL. This is a major difference from HTTP POST method, and you will learn more about HTTP GET/POST soon.



An HTML file can contain hyperlinks to other web pages so users can click on them to visit different web pages. A hyperlink has the general structure of Hyperlink Text. The following is an example hyperlink. Since its href value is not a web page, the *welcome page* of the Google web site, which is the default page sent back if a browser visits the web site without specifying a specific interested page, will be sent back to the web browser.

Google

When you click on a hyperlink, an HTTP GET request will be sent to the web server with all values to be submitted in the form of query strings.

HTTP Protocol

Web browsers interact with web servers with a simple application-level protocol called HTTP (HyperText Transfer Protocol), which runs on top of TCP/IP network connections. When people click on the submit button of an HTML form or a hyperlink in a web browser, a TCP/IP virtual communication channel is created from the browser to the web server specified in the URL; an HTTP GET or POST request is sent through this channel to the destination web application, which retrieves data submitted by the browser user and composes an HTML file; the HTML file is sent back to the web browser as an HTTP response through the same TCP/IP channel; and then the TCP/IP channel is shut down.

The following is the HTTP POST request sent when you type "Ada" in the text field and click on the submit button of the previous file "echoPost.html".

POST /demo/echo HTTP/1.1
Accept: text/html
Accept: audio/x
User-agent: Mozilla/5.0
Referer: http://localhost:8080/demo/echoPost.html
Content-length: 8
user=Ada

The first line, the request line, of a HTTP request is used to specify the submission type, GET or POST; the specific web resource on the web server for receiving and processing the submitted data; and the latest HTTP version that the web browser supports. As of 2010, version 1.1 is the latest HTTP specification.

The following lines, up to before the blank line, are HTTP *header lines* for declaring web browser capabilities and extra information for this submission, each of form "name: value". The first two Accept headers declare that the web browser can process HTML files and any standard audio file formats from the web server. The User-agent header declares the software architecture of the web browser. The Referer (yes this misspelled word is used by the HTTP standard) header specifies the URL of a web page from which this HTTP request is generated (this is how online companies like Amazon and Yahoo collect money for advertisements on their web pages from their sponsors). Any text after the blank line below the header lines is called the *entity body* of the HTTP request, which contains user data submitted through HTTP POST. The Content-length header specifies the exact number of bytes that the entity body contains. If the data is submitted through HTTP GET, the entity body will be empty and the data go to the query string of the submitting URL, as you saw earlier. In response to this HTTP POST request, the web server will forward the submitted data to resource echo of web application demo, and the resource echo (a Java servlet) will generate dynamically an HTML page for most data it can get from the submission and let the web server send the HTML page back to the web browser as the entity body of the following HTTP response.

HTTP/1.1 200 OK
Server: NCSA/1.3
Mime_version: 1.0
Content_type: text/html
Content_length: 2000
<HTML>
……
</HTML>

The first line, the response line, of an HTTP response specifies the latest HTTP version that the web server supports. The first line also provides a web server processing status code, the popular values of which include 200 for OK, 400 if the server doesn't understand the request, 404 if the server cannot find the requested page, and 500 for server internal error. The third entry on the first line is a brief message explaining the status code. The first two header lines declare the web server capabilities and meta-data for the returned data. In this example, the web server is based on a software architecture named "NCSA/1.3", and it supports *Multipurpose Internet Mail Extension* (MIME) specification v1.0 for web browsers to submit text or binary data with multi-parts. The last two header lines declare that the entity body contains HTML data with exactly 2000 bytes. The web browser will parse this HTTP response and present the response data. The HTTP protocol doesn't have memory: the successive HTTP requests don't share data. HTTP GET was initially designed for downloading static web pages from web servers, and it mainly used short query strings to specify the web page search criteria. HTTP POST was initially designed for submitting data to web servers, so it used the request entity body to send data to the web servers as a data stream, and its response normally depended on the submitted data and the submission status. While both HTTP GET and HTTP POST can send user requests to web servers and retrieve HTML pages from web servers for a web browser to present, they have the following subtle but important differences:

- HTTP GET sends data as query strings so people can read the submitted data over submitter's shoulders.
- Web servers have limited buffer size, typically 512 bytes, for accommodating query string data. If a user submits more data than that limit, either the data would be truncated, or the web server would crash, or the submitted data could potentially overwrite some computer code on the server and the server was led to run some hideous code hidden as part of the query string data. The last case is the so-called *buffer overflow*, a common way for hackers to take over the control of a server and spread virus or worms.
- By default web browsers keep (cache) a copy of the web page returned by an HTTP GET request so the future requests to the same URL can be avoided and the cached copy could be easily reused. While this can definitely improve the performance if the requested web page doesn't change, it could be disastrous if the web page or data change with time.

BASIC PROGRAMMING CONCEPTS

Some Terminologies

• **Algorithm / Flowchart**
– A step-by-step procedure for solving a particular problem.
– Independent of the programming language.

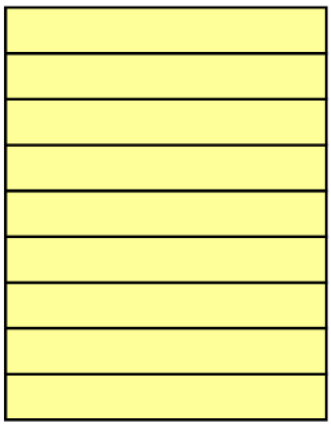
• **Program**
– A translation of the algorithm/flowchart into a form that can be processed by a computer.
– Typically written in a high-level language like C, C++, Java, etc.

Variables and Constants
• Most important concept for problem solving using computers
• All temporary results are stored in terms of variables
– The value of a variable can be changed.
– The value of a constant do not change.

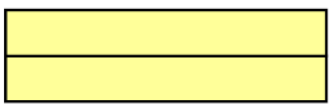
- **Where are they stored?**
  – In main memory.

How does memory look like (logically)?
– As a list of storage locations, each having a unique address.
– Variables and constants are stored in these storage locations.
– A variable is like a bin
• The contents of the bin is the value of the variable
• The variable name is used to refer to the value of the variable
• A variable is mapped to a location of the memory, called its address

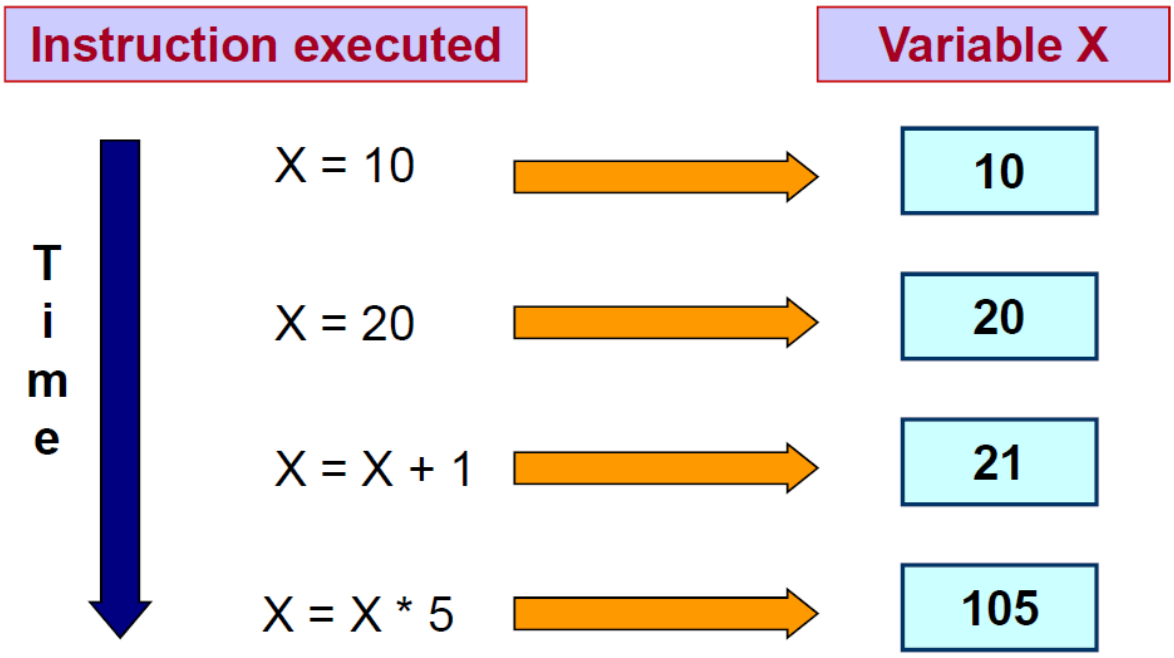
Memory map



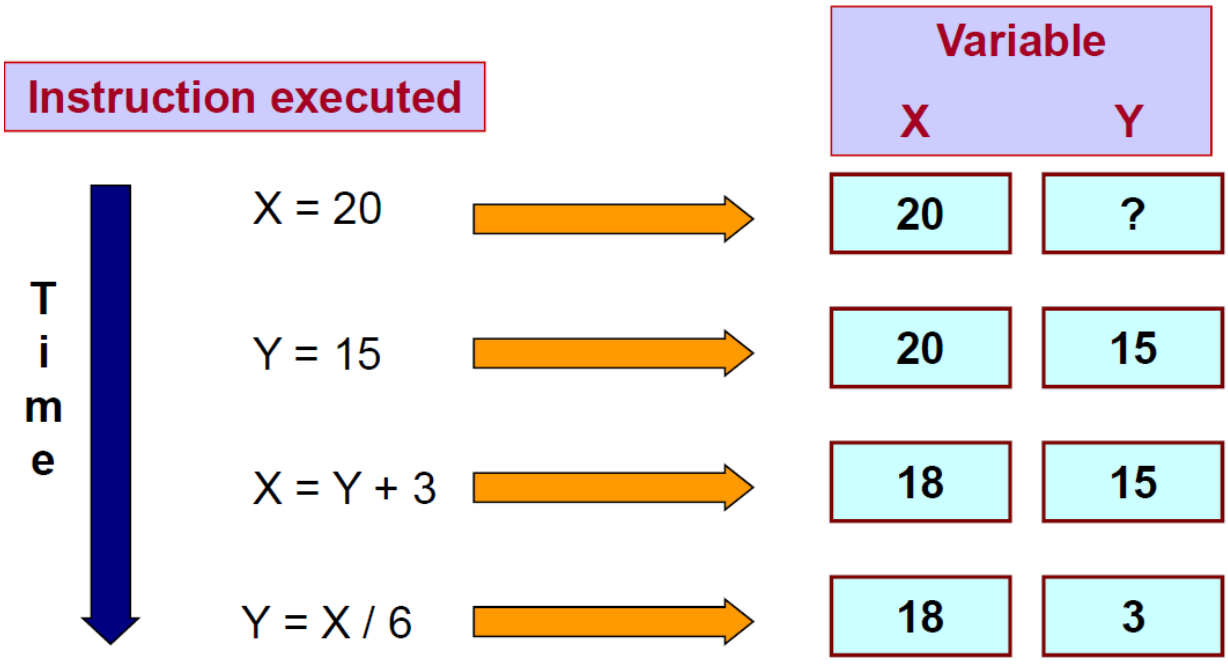
Every variable is mapped to a particular memory address



Variables in Memory



Variables in Memory (contd.)



Data Types

• Three common data types used:

– **Integer ::** can store only whole numbers
• Examples: 25, -56, 1, 0

– **Floating-point ::** can store numbers with fractional values.
• Examples: 3.14159, 5.0, -12345.345

– **Character ::** can store a character
• Examples: 'A', 'a', '*', '3', ' ', '+'

How are they stored in memory?
– **Integer ::**
• 16 bits
• 32 bits

– **Float ::**
• 32 bits
• 64 bits

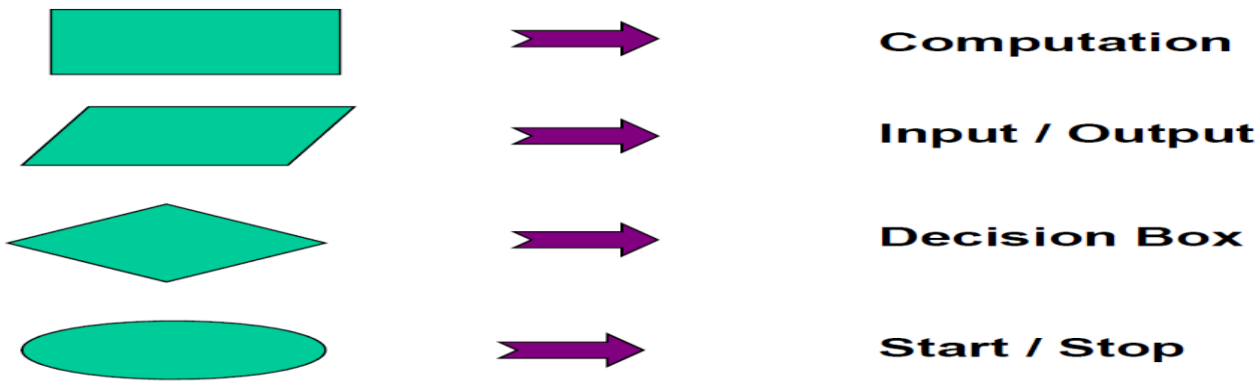
– **Char ::**
• 8 bits (ASCII code)
• 16 bits (UNICODE, used in Java)

NOTE : **Actual number of bits vary from one computer to another**

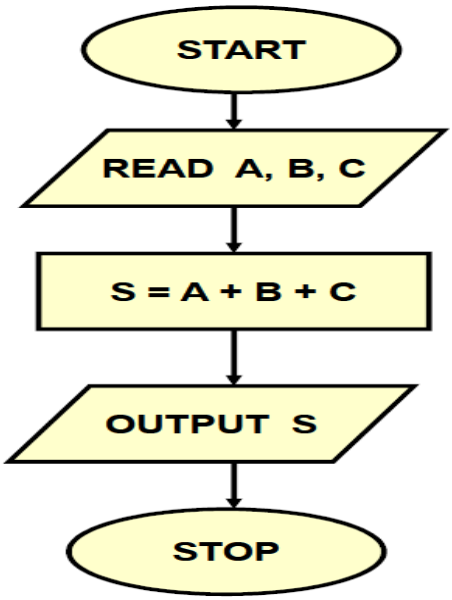
Problem solving

• Step 1:
– Clearly specify the problem to be solved.
• Step 2:
– Draw flowchart or write algorithm.
• Step 3:
– Convert flowchart (algorithm) into program code.
• Step 4:
– Compile the program into object code.
• Step 5:
– Execute the program.

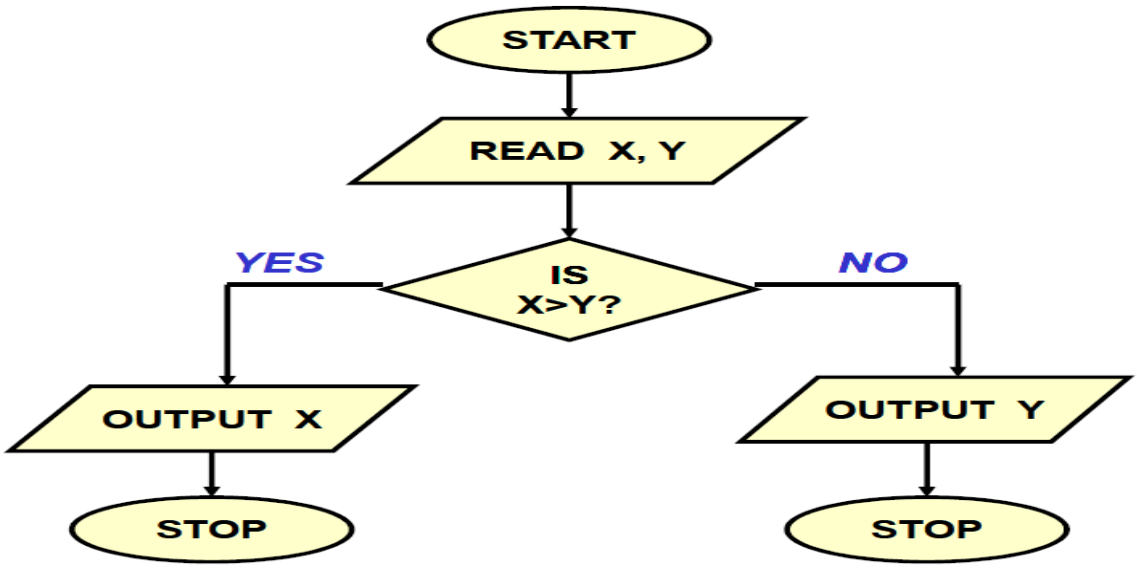
Flowchart: basic symbols



Example 1: *Adding three numbers*



Example 2: *Larger of two numbers*



DATE BASE MANAGEMENT SYSTEM

What is "Data"?
• ANSI definition of data:

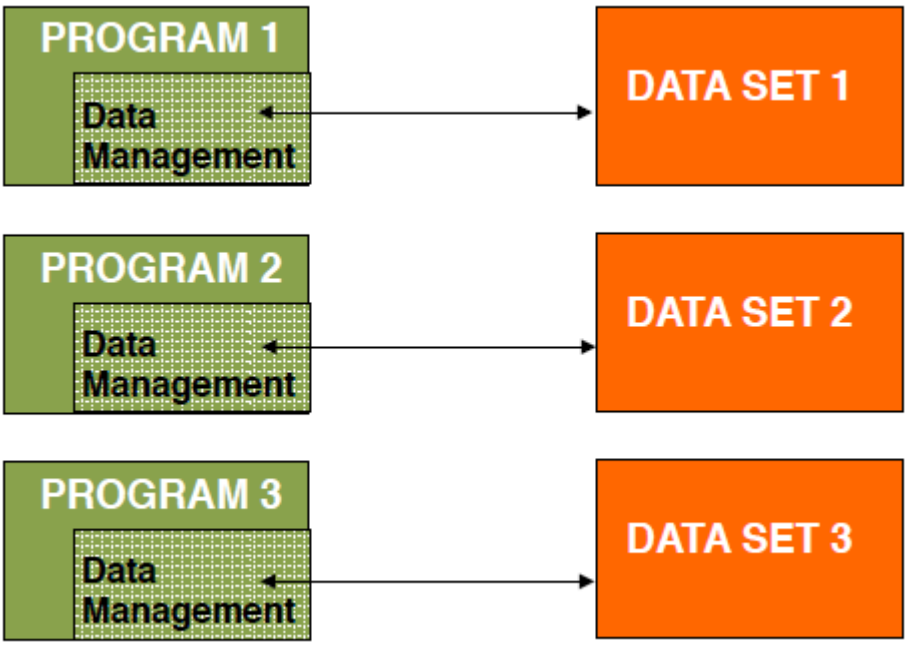
1. A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means.

2. Any representation such as characters or analog quantities to which meaning is or might be assigned. Generally, we perform operations on data or data items to supply some information about an entity.

• Volatile vs persistent data
Our concern is primarily with persistent data

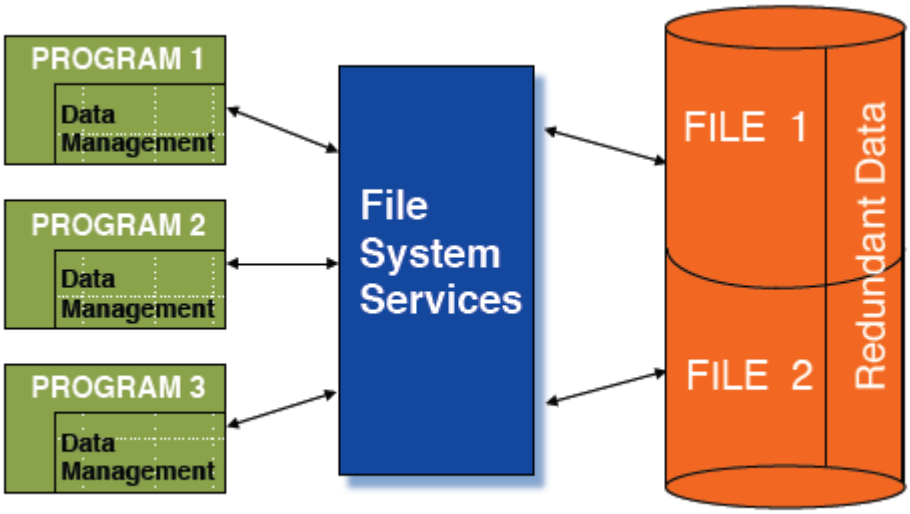
Early Data Management – Ancient History

• Data are not stored on disk
• One data set per program. High data redundancy

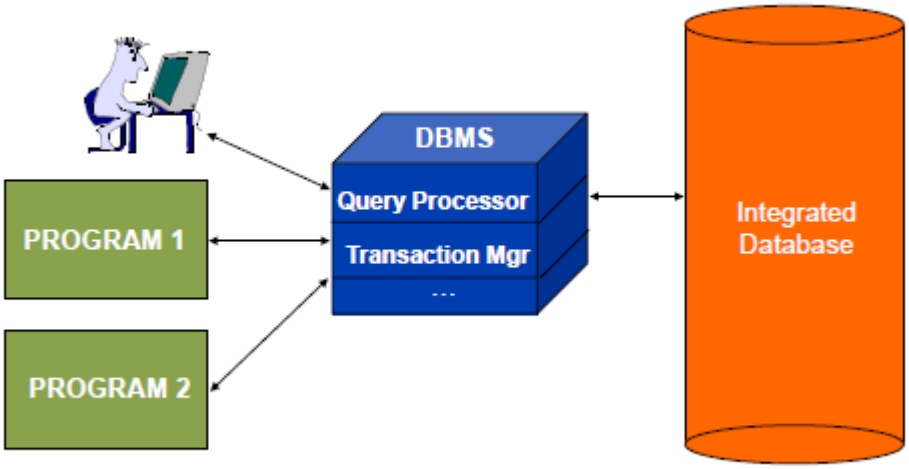


File Processing – More Recent History

• Data are stored in files with interface between programs and files.
• Various access methods exist (e.g., sequential, indexed, random).
• One file corresponds to one or several programs.



Database Approach



What is a Database?

Definition (Database)
A large and persistent collection of (more-or-less similar) pieces of information organized in a way that facilitates efficient retrieval and modification.
The structure of the database is determined by the abstract data model that is used

Examples:
• a file cabinet
• a library system
• a personnel management system

Definition (Database Management System (DBMS))
A program (or set of programs) that manages details related to storage and access for a database.

Data Model
• Formalism that defines what the structure of the data are =) schema

• within a file
• between files

File systems can at best specify data organization within one file
Alternatives for business data
• Hierarchical; network
• Relational
• Object-oriented (more recently object-relational)

Schema and Instance

Definition (Schema)
A schema is a description of the data interface to the database (i.e., how the data is organized).

Definition (Instance)
A database instance is a database (real data) that conforms to a given schema.
A schema can have many instances.

Example – Relational

• Schema
  • EMP(ENO, ENAME, TITLE)
  • PROJ(PNO, PNAME, BUDGET)
  • WORKS(ENO, PNO, RESP, DUR)

• Instance

EMP

ENO	ENAME	TITLE
E1	J. Doe	Elect. Eng
E2	M. Smith	Syst. Anal.
E3	A. Lee	Mech. Eng.
E4	J. Miller	Programmer
E5	B. Casey	Syst. Anal.
E6	L. Chu	Elect. Eng.
E7	R. Davis	Mech. Eng.
E8	J. Jones	Syst. Anal.

PROJ

PNO	PNAME	BUDGET
P1	Instrumentation	150000
P2	Database Develop.	135000
P3	CAD/CAM	250000
P4	Maintenance	310000

WORKS

ENO	PNO	RESP	DUR
E1	P1	Manager	12
E2	P1	Analyst	24
E2	P2	Analyst	6
E3	P3	Consultant	10
E3	P4	Engineer	48
E4	P2	Programmer	18
E5	P2	Manager	24
E6	P4	Manager	48
E7	P3	Engineer	36
E8	P3	Manager	40

Application of Databases

Original
• inventory control
• payroll
• banking and financial systems
• reservation systems

More recent
• computer aided design (CAD)
• software development (CASE, SDE/SSE)
• telecommunication systems
• e-commerce
• dynamic/personalized web content

Common Circumstances:
• There is lots of data (mass storage)
• Data is formatted

Requirements:
• persistence and reliability
• efficient and concurrent access

Issues:
• many files with different structure
• shared files or replicated data
• need to exchange data (translation programs)

Why Database Technology?

• Data constitute an organizational asset =) Integrated control
• Reduction of redundancy
• Avoidance of inconsistency
• Data integrity
• Sharability
• Improved security

Programmer productivity =) Data Independence
• Programmers do not have to deal with data organization

DATABASE MANAGEMENT SYSTEM (DBMS)

DEFINITION:-
A database management system is a collection of interrelated data and a set of programs to access those data.
Collection of data is referred to as a database. Primary goal of dbms is to provide a way to store and retrieve database information that is both convenient and efficient. Dbms allows us to define structure for storage of information and also provides mechanism to manipulate this information. Dbms also provides safety for the information stored despite system crashes or attempts of authorized access.

Limitations of data processing environment:-

1) *Data redundancy and consistency*:- Different files have different formats of programs written in different programming languages by different users. So the same information may be duplicated in several files. It may lead to data inconsistency. If a customer changes his address, then it may be reflected in one copy of data but not in the other.

2) *Difficulty in accessing data*:- The file system environment does not allow needed data to be retrieved in a convenient and efficient manner.

3) *Data isolation*:- Data is scattered in various files; so it gets isolated because file may be in different formats.

4) *Integrity problems*:- Data values stored in the database must satisfy consistency constraints. Problem occurs when constraints involve several data items from different files.

5) *Atomicity problems*:- If failure occurs, data must be stored to constant state that existed prior to failure. For example, if in a bank account, a person abc is transferring Rs 5000 to the account of pqr, and abc has withdrawn the money but before it gets deposited to the pqr's account, the system failure occurs, then Rs5000 should be deposited back to abc's bank account.

6) *Concurrent access anomalies*:- Many systems allow multiple users to update data simultaneously. Concurrent updates should not result in inconsistent data.

7) *Security problems*:- Not every user of the database system should be able to access all data. Data base should be protected from access by unauthorized users.

DATA INDEPENDENCE

We can define two types of data independence:

1. **Logical data independence**:
It is the capacity to change the conceptual schema without having to change external schemas or application programs. We may change the conceptual schema to expand the database (by adding a record type or data item), or to reduce the database (by removing a record type or data item). In the latter case, external schemas that refer only to the remaining data should not be affected. Only the view definition and the mappings need be changed in a DBMS that supports logical data independence. Application programs that reference the external schema constructs must work as before, after the conceptual schema undergoes a logical reorganization. Changes to constraints can be applied also to the conceptual schema without affecting the external schemas or application programs.

2. Physical data independence:
It is the capacity to change the internal schema without having to change the conceptual (or external) schemas. Changes to the internal schema may be needed because some physical files had to be reorganized—for example, by creating additional access structures—to improve the performance of retrieval or update. If the same data as before remains in the database, we should not have to change the conceptual schema. Whenever we have a multiplelevel DBMS, its catalog must be expanded to include information on how to map requests and data among the various levels. The DBMS uses additional software to accomplish these mappings by referring to the mapping information in the catalog. Data independence is accomplished because, when the schema is changed at some level, the schema at the next higher level remains unchanged; only the mapping between the two levels is changed. Hence, application programs referring to the higher-level schema need not be changed.

DATA ABSTRACTION:

Major purpose of dbms is to provide users with abstract view of data i.e. the system hides certain details of how the data are stored and maintained. Since database system users are not computer trained, developers hide the complexity from users through *3 levels of abstraction*, to simplify user's interaction with the system.

1) Physical level of data abstraction:
This s the lowest level of abstraction which describes how data are actually stored.

2) Logical level of data abstraction:
This level hides what data are actually stored in the database and what relationship exists among them.

3) View Level of data abstraction:
View provides security mechanism to prevent user from accessing certain parts of database.

DATA MODELS

Many data models have been proposed, and we can categorize them according to the types of concepts they use to describe the database structure. **High-level** or **conceptual data models** provide concepts that are close to the way many users perceive data, whereas **lowlevel** or **physical data models** provide concepts that describe the details of how data is stored in

the computer. Concepts provided by low-level data models are generally meant for computer specialists, not for typical end users. Between these two extremes is a class of **representational (or implementation) data models**, which provide concepts that may be understood by end users but that are not too far removed from the way data is organized within the computer. Representational data models hide some details of data storage but can be implemented on a computer system in a direct way. Conceptual data models use concepts such as entities, attributes, and relationships.

An entity represents a real-world object or concept, such as an employee or a project, that is described in the database. An attribute represents some property of interest that further describes an entity, such as the employee's name or salary. A relationship among two or more entities represents an interaction among the entities, which is explained by the **Entity-Relationship model**—a popular high-level conceptual data model.

Representational or implementation data models are the models used most frequently in traditional commercial DBMSs, and they include the widely-used relational data model, as well as the so-called legacy data models—the network and hierarchical models—that have been widely used in the past.

We can regard object data models as a new family of higherlevel implementation data models that are closer to conceptual data models.

Object data models are also frequently utilized as highlevel conceptual models, particularly in the software engineering domain. Physical data models describe how data is stored in the computer by representing information such as record formats, record orderings, and access paths. An access path is a structure that makes the search for particular database records efficient.

DBMS ARCHITECTURE

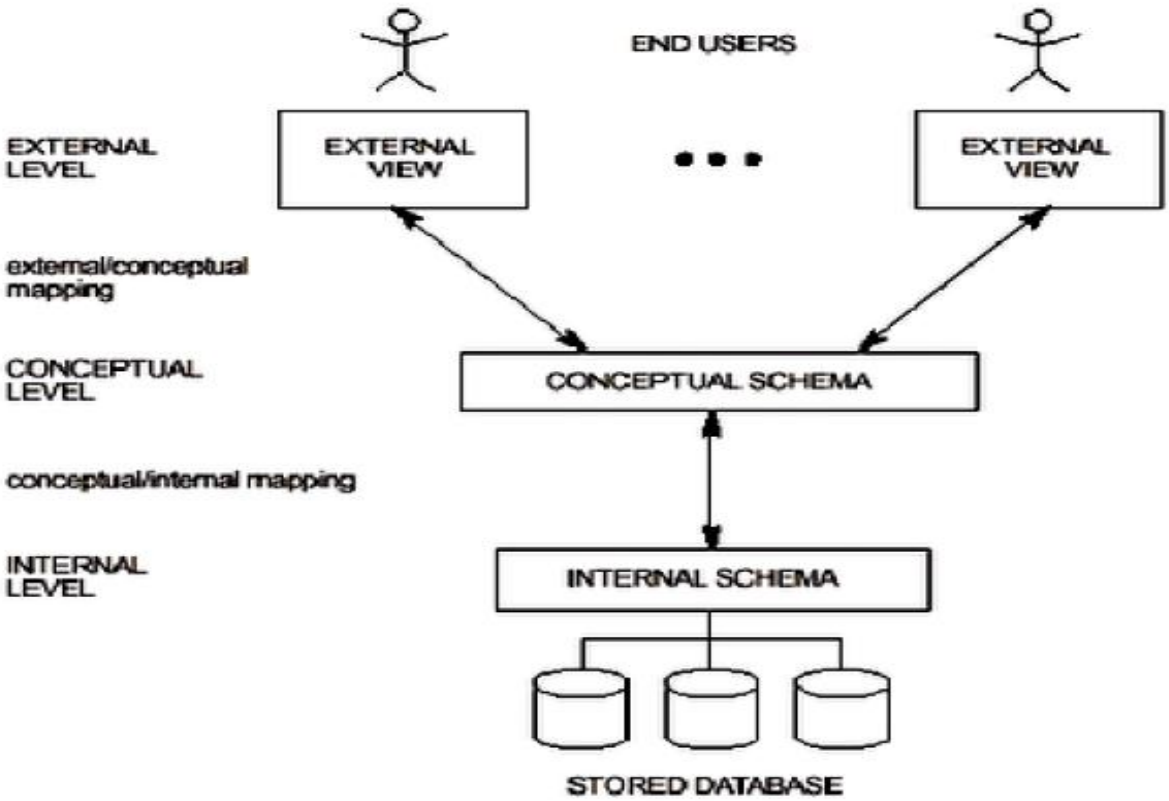


Fig: Three-Schema DBMS Architecture

The goal of the three-schema architecture, illustrated in above Figure, is to separate the user applications and the physical database. In this architecture, schemas can be defined at the following three levels:

1. The internal level has an **internal schema**, which describes the physical storage structure of the database. The internal schema uses a physical data model and describes the complete details of data storage and access paths for the database.

2. The conceptual level has a **conceptual schema**, which describes the structure of the whole database for a community of users. The conceptual schema hides the details of physical storage structures and concentrates on describing entities, data types, relationships, user operations, and constraints. A high-level data model or an implementation data model can be used at this level.

3. The external or **view level** includes a number of external schemas or user views. Each external schema describes the part of the database that a particular user group is interested in and hides the rest of the database from that user group. A high-level data model or an implementation data model can be used at this level.

The three-schema architecture is a convenient tool for the user to visualize the schema levels in a database system. In most DBMSs that support user views, external schemas are specified in the same data model that describes the conceptual-level information. Some DBMSs allow different data models to be used at the conceptual and external levels. Notice that the three schemas are only descriptions of data; the only data that actually exists is at the physical level. In a DBMS based on the three schema architecture, each user group refers only to its own external schema. Hence, the DBMS must transform a request specified on an external schema into a request against the conceptual schema, and then into a request on the internal schema for processing over the stored database. If the request is database retrieval, the data extracted from the stored database must be reformatted to match the user's external view. The processes of transforming requests and results between levels are called mappings. These mappings may be time-consuming, so some DBMSs—especially those that are meant to support small databases—do not support external views. Even in such systems, however, a certain amount of mapping is necessary to transform requests between the conceptual and internal levels.

ENTITY RELATIONSHIP MODEL

Topics Covered:

- Entity
- Attributes
- Keys
- Relation
- Cardinality
- Participation
- Weak Entities
- ER Diagram
- Conceptual Design With ER Model

ENTITY

• The basic object that the ER model represents is an **entity**, which is a "thing" in the real world with an independent existence.
• An entity may be an object with a physical existence—a particular person, car, house, or employee—or it may be an object with a conceptual existence—a company, a job, or a university course.

ATTRIBUTES

• Each entity has attributes—the particular properties that describe it.
• For example, an employee entity may be described by the employee's name, age, address, salary, and job.
• A particular entity will have a value for each of its attributes.
• The attribute values that describe each entity become a major part of the data stored in the database.
• Several types of attributes occur in the ER model: *simple versus composite*; *single-valued versus multi-valued*; and *stored versus derived*.

Composite versus Simple (Atomic) Attributes

• Composite attributes can be divided into smaller subparts, which represent more basic attributes with independent meanings.
• For example, the Address attribute of the employee entity can be sub-divided into Street_Name, City, State, and Zip.

• Attributes that are not divisible are called simple or atomic attributes.
• Composite attributes can form a hierarchy; for example, Name can be subdivided into three simple attributes, First_Name, Middle Name, Last_Name.
• The value of a composite attribute is the concatenation of the values of its constituent simple attributes.

Single-valued Versus Multi-valued Attributes
• Attributes which have only one value for a entity are called single valued attributes.
• E.g. For a student entity, RollNo attribute has only one single value.
• But phone number attribute may have multiple values. Such values are called Multi-valued attributes.

Stored Versus Derived Attributes
• Two or more attribute values are related—for example, the Age and Birth Date attributes of a person.
• For a particular person entity, the value of Age can be determined from the current (today's) date and the value of that person's Birth Date.
• The Age attribute is hence called a *derived*
• The attribute from which another attribute value is derived is called *stored attribute*.
• In the above example, date of birth is the stored attribute.
• Take another example, if we have to calculate the interest on some principal amount for a given time, and for a particular rate of interest, we can simply use the interest formule

Interest=NPR/100;

• In this case, interest is the derived attribute whereas principal amount(P), time(N) and rate of interest(R) are all stored attributes.

KEYS

• An important constraint on the entities of an entity type is the **key** or **uniqueness constraint** on attributes.
• A key is an attribute (also known as column or field) or a combination of attribute that is used to identify records.
• Sometimes we might have to retrieve data from more than one table, in those cases we require to join tables with the help of keys.
• The purpose of the key is to bind data together across tables without repeating all of the data in every table
• Such an attribute is called a **key attribute**, and its values can be used to identify each entity uniquely.
• For example, the Name attribute is a key of the COMPANY entity type because no two companies are allowed to have the same name.
• For the PERSON entity type, a typical key attribute is SocialSecurityNumber.
• Sometimes, several attributes together form a key, meaning that the combination of the attribute values must be distinct for each entity.
• If a set of attributes possesses this property, we can define a composite attribute that becomes a key attribute of the entity type.

The various types of key with e.g. in SQL are mentioned below, (For examples let suppose we have an Employee Table with attributes 'ID' , 'Name' ,'Address' , 'Department_ID' ,'Salary')

(I) Super Key – An attribute or a combination of attribute that is used to identify the records uniquely is known as Super Key. A table can have many Super Keys.

E.g. of Super Key
1 ID
2 ID, Name
3 ID, Address
4 ID, Department_ID
5 ID, Salary
6 Name, Address
7 Name, Address, Department_ID …… So on as any combination which can identify the records uniquely will be a Super Key.

(II) Candidate Key – It can be defined as minimal Super Key or irreducible Super Key. In other words an attribute or a combination of attribute that identifies the record uniquely but none of its proper subsets can identify the records uniquely.

E.g. of Candidate Key
1 Code
2 Name, Address
For above table we have only two Candidate Keys (i.e. Irreducible Super Key) used to identify the records from the table uniquely. Code Key can identify the record uniquely and similarly combination of Name and Address can identify the record uniquely, but neither Name nor Address can be used to identify the records uniquely as it might be possible that we have two employees with similar name or two employees from the same house.

(III) Primary Key – A Candidate Key that is used by the database designer for unique identification of each row in a table is known as Primary Key. A Primary Key can consist of one or more attributes of a table.

E.g. of Primary Key - Database designer can use one of the Candidate Key as a Primary Key. In this case we have "Code" and "Name, Address" as Candidate Key, we will consider "Code" Key as a Primary Key as the other key is the combination of more than one attribute.

(IV) Foreign Key – A foreign key is an attribute or combination of attribute in one base table that points to the candidate key (generally it is the primary key) of another table. The purpose of the foreign key is to ensure referential integrity of the data i.e. only values that are supposed to appear in the database are permitted.

E.g. of Foreign Key – Let consider we have another table i.e. Department Table with Attributes "Department_ID", "Department_Name", "Manager_ID", "Location_ID" with Department_ID as an Primary Key. Now the Department_ID attribute of Employee Table (dependent or child table) can be defined as the Foreign Key as it can reference to the Department_ID attribute of the Departments table (the referenced or parent table), a Foreign Key value must match an existing value in the parent table or be NULL.

(V) Composite Key – If we use multiple attributes to create a Primary Key then that Primary Key is called Composite Key (also called a Compound Key or Concatenated Key).

E.g. of Composite Key, if we have used "Name, Address" as a Primary Key then it will be our Composite Key.

(VI) Alternate Key – Alternate Key can be any of the Candidate Keys except for the Primary Key.

E.g. of Alternate Key is "Name, Address" as it is the only other Candidate Key which is not a Primary Key.

(VII) Secondary Key – The attributes that are not even the Super Key but can be still used for identification of records (not unique) are known as Secondary Key.

E.g. of Secondary Key can be Name, Address, Salary, Department_ID etc. as they can identify the records but they might not be unique.

RELATION

• There are several implicit relationships among the various entity types.
• In fact, whenever an attribute of one entity type refers to another entity type, some relationship exists.
• For example, the attribute Manager of department refers to an employee who manages the department.
• In the ER model, these references should not be represented as **relationships** or **relation**. There is a relation "borrower" in the entities customer and account which can be shown as follows:

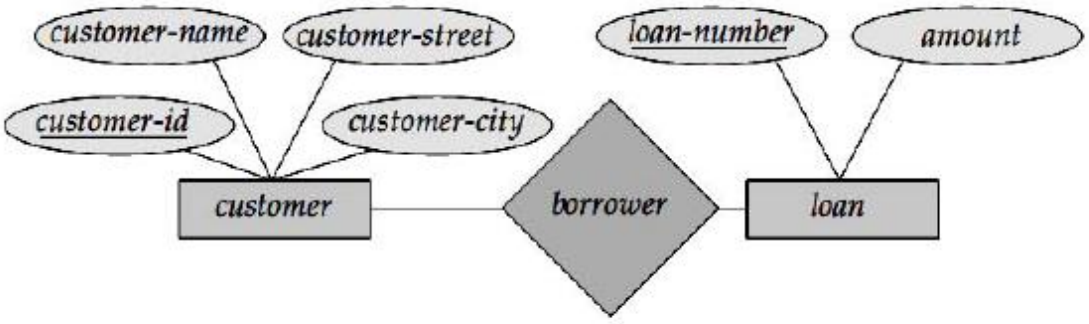


Figure: E-R diagram corresponding to customers and loans.

CARDINALITY

Mapping cardinalities, or cardinality ratios, express the number of entities to which another entity can be associated via a relationship set. For a relationship set R between entity sets A and B, the mapping cardinality must be one of the following:

There are three types of relationships
1) One to one
2) One to many
3) Many to many

One to one:
An entity in A is associated with at most one entity in B, and an entity in B is associated with at most one entity in A.

One to many:
An entity in A is associated with any number (zero or more) of entities in B. An entity in B, however, can be associated with at most one entity in A.

Many to one:
An entity in A is associated with at most one entity in B. An entity in B, however, can be associated with any number (zero or more) of entities in A.

Many to many:
An entity in A is associated with any number (zero or more) of entities in B, and an entity in B is associated with any number (zero or more) of entities in A.

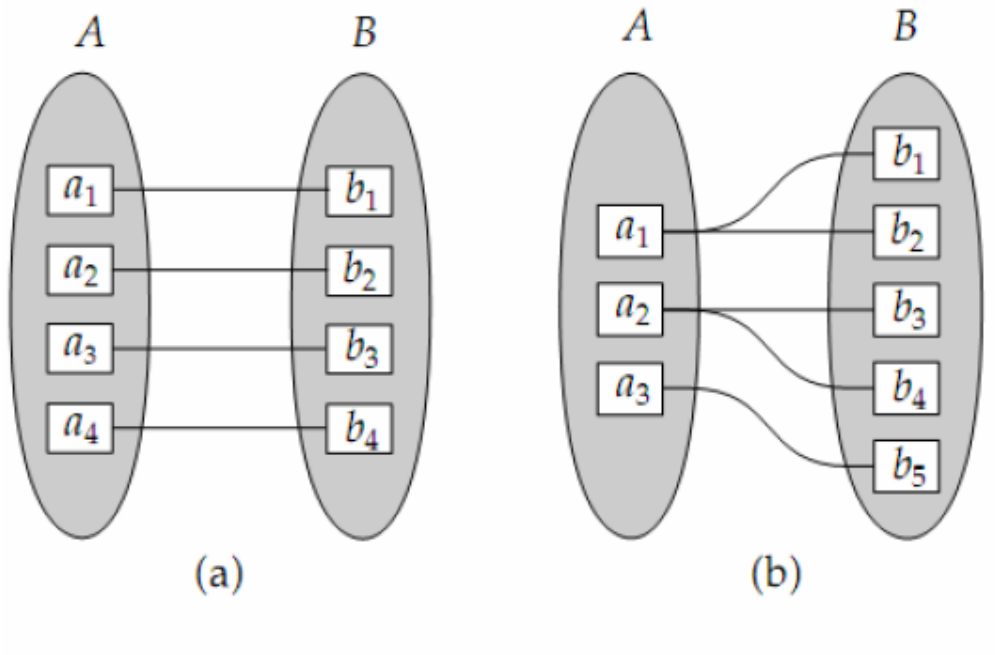
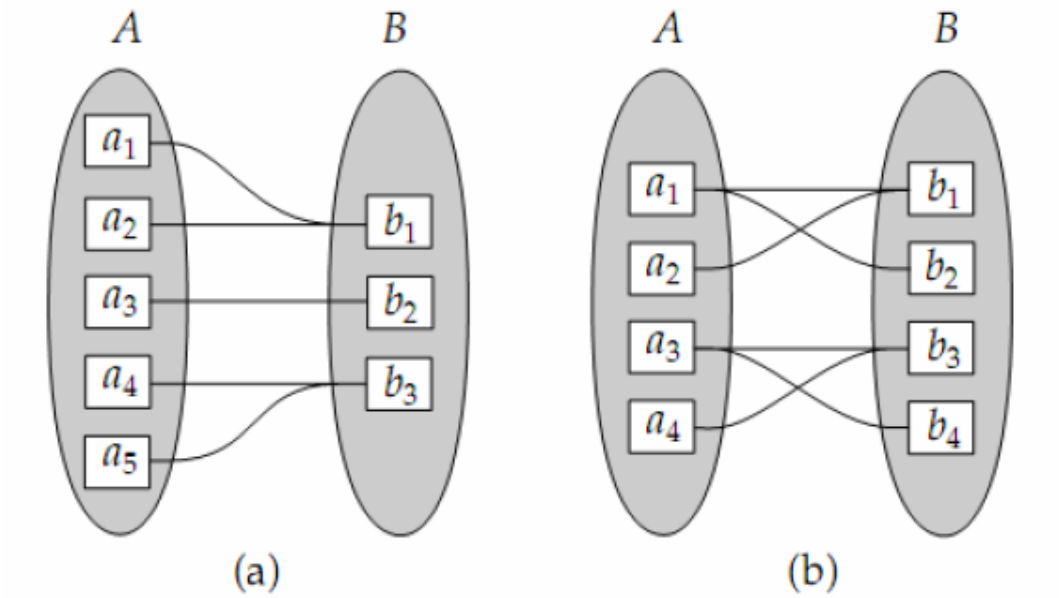


Figure: Mapping cardinalities. (a) One to one. (b) One to many.



Figure; Mapping cardinalities. (a) Many to one. (b) Many to many

PARTICIPATION

• The participation of an entity set E in a relationship set R is said to be **total** if every entity in E participates in at least one relationship in R.
• If only some entities in E participate in relationships in R, the participation of entity set E in relationship R is said to be **partial**.
• For example, we expect every loan entity to be related to at least one customer through the borrower relationship.
• Therefore the participation of loan in the relationship set borrower is total.
• In contrast, an individual can be a bank customer whether or not she has a loan with the bank.
• Hence, it is possible that only some of the customer entities are related to the loan entity set through the borrower relationship, and the participation of customer in the borrower relationship set is therefore partial.

WEAK ENTITIES

• An entity set may not have sufficient attributes to form a primary key.
• Such an entity set is termed a *weak entity set*.
• An entity set that has a primary key is termed a strong entity set.
• As an illustration, consider the entity set payment, which has the three attributes: payment-number, payment-date, and paymentamount.
• Payment numbers are typically sequential numbers, starting from 1, generated separately for each loan.
• Thus, al-though each payment entity is distinct, payments for different loans may share the same payment number. Thus, this entity set does not have a primary key; it is a weak entity set.
• For a weak entity set to be meaningful, it must be associated with another entity set, called the identifying or owner entity set.
• Every weak entity must be associated with an identifying entity; that is, the weak entity set is said to be existence dependent on the identifying entity set.
• The identifying entity set is said to own the weak entity set that it identifies.
• The relationship associating the weak entity set with the identifying entity set is called the identifying relationship.
• The identifying relationship is many to one from the weak entity set to the identifying entity set, and the participation of the weak entity set in the relationship is total.
• In our example, the identifying entity set for payment is loan, and a relationship loan-payment that associates payment entities with their corresponding loan entities is the identifying relationship.
• Although a weak entity set does not have a primary key, we nevertheless need a means of distinguishing among all those entities in the weak entity set that depend on one particular strong entity.
• The discriminator of a weak entity set is a set of attributes that allows this distinction to be made.
• For example, the discriminator of the weak entity set payment is the attribute payment-number, since, for each loan, a payment number uniquely identifies one single payment for that loan.
• The discriminator of a weak entity set is also called the partial key of the entity set.
• The primary key of a weak entity set is formed by the primary key of the identifying entity set, plus the weak entity set's discriminator.
• In the case of the entity set payment, its primary key is {loannumber, payment-number}, where loan-number is the primary key of the identifying entity set, namely loan, and paymentnumber distinguishes payment entities within the same loan.
• The identifying relationship set should have no descriptive attributes, since any required attributes can be associated with the weak entity set
• A weak entity set can participate in relationships other than the identifying relationship.
• For instance, the payment entity could participate in a relationship with the account entity set, identifying the account from which the payment was made.
• A weak entity set may participate as owner in an identifying relationship with another weak entity set.
• It is also possible to have a weak entity set with more than one identifying entity set.
• A particular weak entity would then be identified by a combination of entities, one from each identifying entity set.
• The primary key of the weak entity set would consist of the union of the primary keys of the identifying entity sets, plus the discriminator of the weak entity set.
• In E-R diagrams, a doubly outlined box indicates a weak entity set, and a doubly outlined diamond indicates the corresponding identifying relationship.
• The weak entity set payment depends on the strong entity set loan via the relationship set loan-payment.
• The figure also illustrates the use of double lines to indicate total participation—the participation of the (weak) entity set payment in the relationship loan-payment is total, meaning that every payment must be related via loan-payment to some loan.

Finally, the arrow from loan-payment to loan indicates that each payment is for a single loan. The discriminator of a weak entity set also is underlined, but with a dashed, rather than a solid, line.

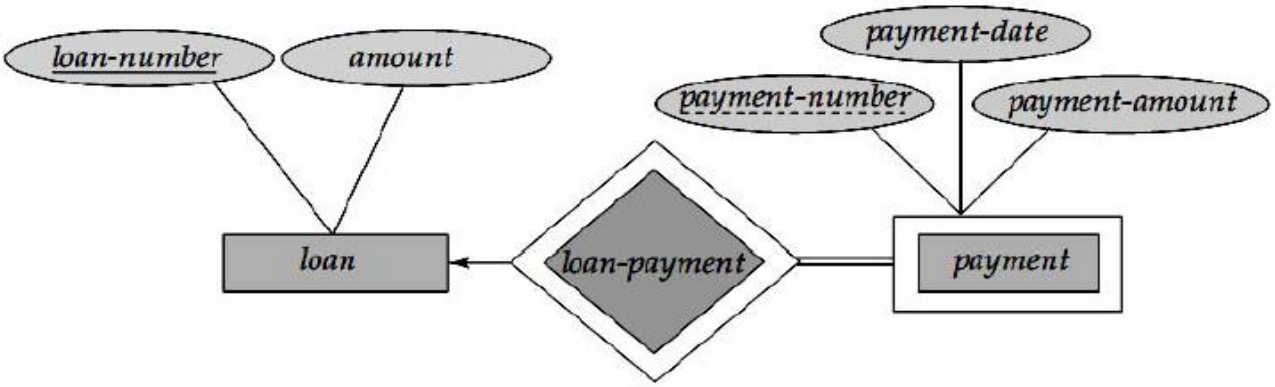
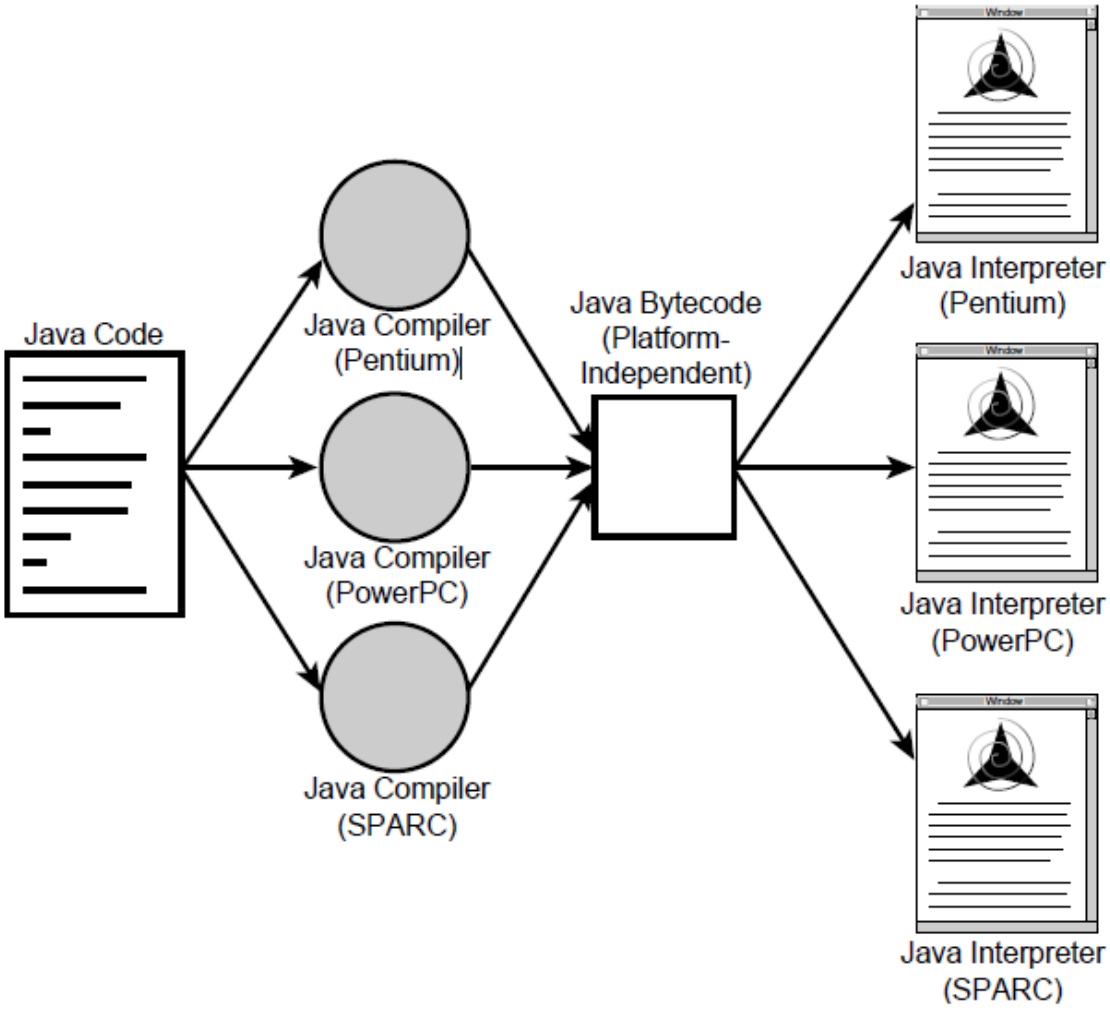


Figure: E-R diagram with a weak entity set.

JAVA PROGRAMMING

What Is Java?
Java is an object-oriented programming language developed by Sun Microsystems, a company best known for its high-end Unix workstations. Modeled after C++, the Java language was designed to be small, simple, and portable across platforms and operating systems, both at the source and at the binary level.

To run a Java program, you run a program called a bytecode interpreter, which in turn executes your Java program (Fig Below). You can either run the interpreter by itself, or—for applets— there is a bytecode interpreter built into HotJava and other Java-capable browsers that runs the applet for you.



Java – Basic Program

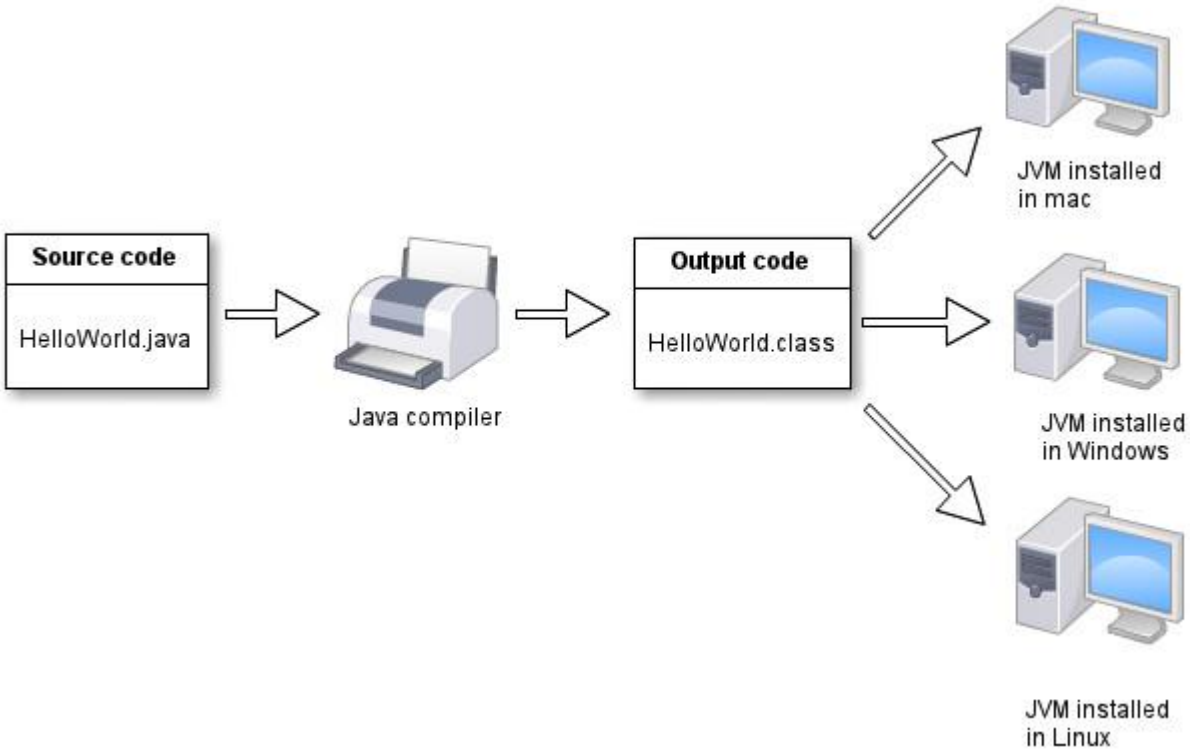
Three things need to be done to make a java program work. They are

1. Create,
2. Compile, and
3. Run

* A source file with .java extension is created and is compiled by java compiler which yields a class file with .class extension

* This class file is run by the JVM and gives the result.

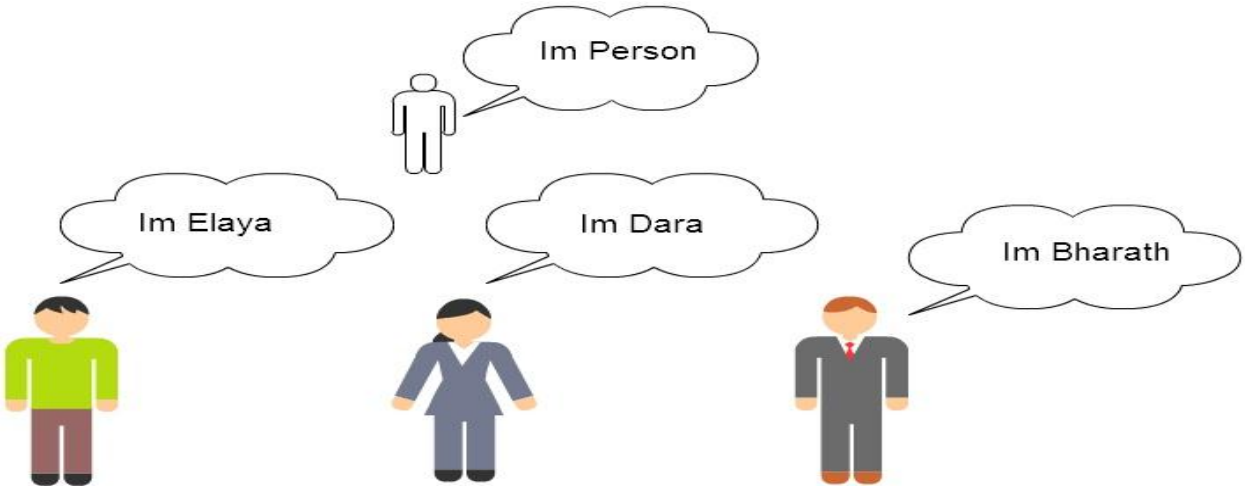
* A class file, if it is created in a windows environment can run and gives the same result in linux environment and so on. That is why, java is platform independent.

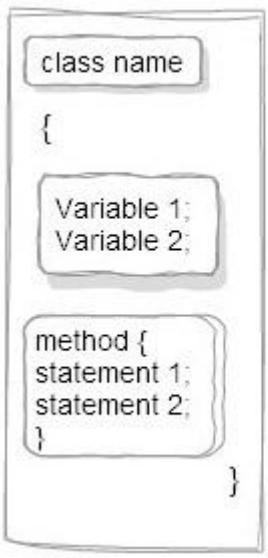


Java – Class and Object

- Objects are anything that exists in the world. A Class is a blueprint to develop objects.
- If you consider creating objects like chair, table, cupboard, then you need to create class called Furniture. Similarly by using Person class, we can create objects like Elaya, Dara, Bharath etc.

- Class contains variables and methods.
- Variables are attributes or peoperties.
- Method perform the functions or actions.





Java Is Object-Oriented

To some, object-oriented programming (OOP) technique is merely a way of organizing programs, and it can be accomplished using any language. Working with a real object-oriented language and programming environment, however, enables you to take full advantage of objectoriented methodology and its capabilities of creating flexible, modular programs and reusing code.

Many of Java's object-oriented concepts are inherited from C++, the language on which it is based, but it borrows many concepts from other object-oriented languages as well. Like most object-oriented programming languages, Java includes a set of class libraries that provide basic data types, system input and output capabilities, and other utility functions. These basic classes are part of the Java development kit, which also has classes to support networking, common Internet protocols, and user interface toolkit functions. Because these class libraries are written in Java, they are portable across platforms as all Java applications are.

An Introduction to Java Programming

Java is modeled after C and C++, and much of the syntax and object-oriented structure is borrowed from the latter. If you are familiar with C++, learning Java will be particularly easy for you, because you have most of the foundation already.

Although Java looks similar to C and C++, most of the more complex parts of those languages have been excluded from Java, making the language simpler without sacrificing much of its power. There are no pointers in Java, nor is there pointer arithmetic. Strings and arrays are real objects in Java. Memory management is automatic. To an experienced programmer, these omissions may be difficult to get used to, but to beginners or programmers who have worked in other languages, they make the Java language far easier to learn.

Creating a Java Application

Let's start by creating a simple Java application: the classic Hello World example that all language books use to begin.

As with all programming languages, your Java source files are created in a plain text editor, or in an editor that can save files in plain ASCII without any formatting characters. On Unix,emacs, ped, or vi will work; on Windows, Notepad or DOS Edit are both text editors. Fire up your editor of choice, and enter the Java program shown in Listing 1.1. Type this program, as shown, in your text editor. Be careful that all the parentheses, braces, and quotes are there.

Listing 1.1. Your first Java application.

```
1: class HelloWorld {
2: public static void main (String args[]) {
3: System.out.println("Hello World!");
4: }
5: }
```

This program has two main parts:

- All the program is enclosed in a class definition—here, a class called HelloWorld.

- The body of the program (here, just the one line) is contained in a routine called main(). In Java applications, as in a C or C++ program, main() is the first routine that is run when the program is executed

Creating a Java Applet

Creating applets is different from creating a simple application, because Java applets run and are displayed inside a Web page with other page elements and as such have special rules for how they behave. Because of these special rules for applets in many cases (particularly the simple ones), creating an applet may be more complex than creating an application.
For example, to do a simple Hello World applet, instead of merely being able to print a message, you have to create an applet to make space for your message and then use graphics operations to paint the message to the screen.

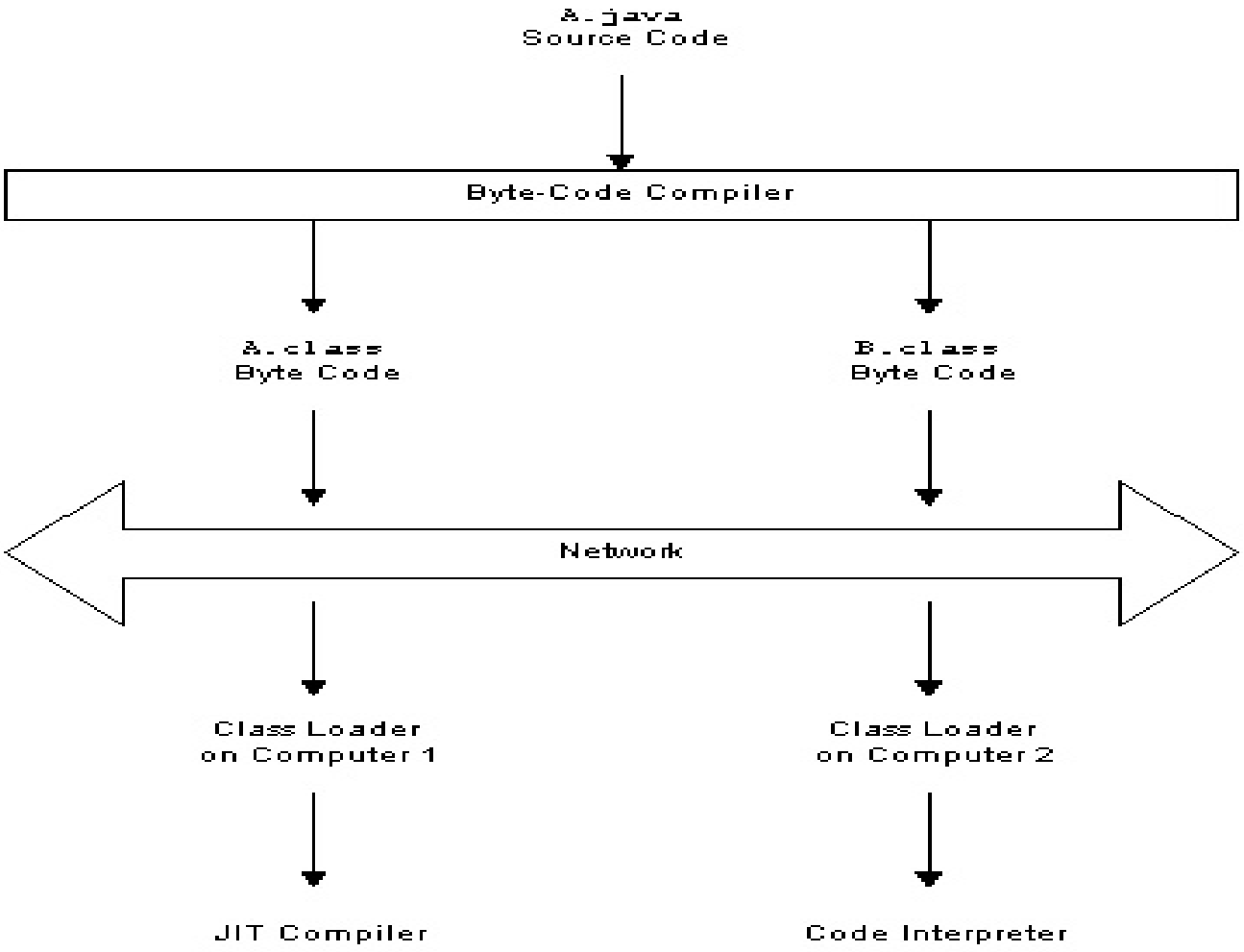
Java Program Structure

A file containing Java source code is considered a compilation unit. Such a compilation unit contains a set of classes and, optionally, a package definition to group related classes together. Classes contain data and method members that specify the state and behavior of the objects in your program.

Java programs come in two flavors:
• Standalone applications that have no initial context such as a pre-existing main window
• Applets for WWW programming The major differences between applications and applets are:
• Applets are not allowed to use file I/O and sockets (other than to the host platform). Applications do not have these restrictions.
• An applet must be a subclass of the Java Applet class. Aplications do not need to subclass any particular class.
• Unlike applets, applications can have menus.
• Unlike applications, applets need to respond to predefined lifecycle messages from the WWW browser in which they're running.

Java Program Execution

The Java byte-code compiler translates a Java source file into machine independent byte code. The byte code for each publicly visible class is placed in a separate file, so that the Java runtime system can easily find it. If your program instantiates an object of class A, for example, the class loader searches the directories listed in your CLASSPATH environment variable for a file called A.class that contains the class definition and byte code for class A. There is no link phase for Java programs; all linking is done dynamically at runtime.
The following diagram shows an example of the Java compilation and execution sequence for a source file named A.java containing public class A and non-public class B:



Java programs are, in effect, distributed applications. You may think of them as a collection of DLLs (dynamically loadable libraries) that are linked on demand at runtime. When you write your own Java applications, you will often integrate your program with already-existing portions of code that reside on other machines.

Applet Execution

An applet is a Java program that runs within a Java-compatible WWW browser or in an appletviewer. To execute your applet, the browser:

• Creates an instance of your applet

• Sends messages to your applet to automatically invoke predefined lifecycle methods The predefined methods automatically invoked by the runtime system are:

• *init( )*. This method takes the place of the Applet constructor and is only called once during applet creation. Instance variables should be initialized in this method. GUI components such as buttons and scrollbars should be added to the GUI in this method.

• *start( )*. This method is called once after init() and whenever your applet is revisited by your browser, or when you deiconify your browser. This method should be used to start animations and other threads.

- paint(Graphics g). This method is called when the applet drawing area needs to be redrawn. Anything not drawn by contained components must be drawn inthis method. Bitmaps, for example, are drawn here, but buttons are not because

they handle their own painting.

• *stop( )*. This method is called when you leave an applet or when you iconify your browser. The method should be used to suspend animations and other threads so they do not burden system resources unnecessarily. It is guaranteed to be called before destroy().

• destroy(). This method is called when an applet terminates, for example, when quitting the browser. Final clean-up operations such as freeing up system resources with dispose() should be done here. The dispose() method of Frame removes the menu bar. Therefore, do not forget to call super.dispose() if you override the default behavior.

The basic structure of an applet that uses each of these predefined methods is:

```
import java.applet.Applet;
// include all AWT class definitions
import java.awt.*;
public class AppletTemplate extends Applet {
public void init( ) {
// create GUI, initialize applet
}
public void start( ) {
// start threads, animations etc…
}
public void paint(Graphics g) {
// draw things in g
}
public void stop( ) {
// suspend threads, stop animations etc…
}
public void destroy( ) {
// free up system resources, stop threads
}
}
```

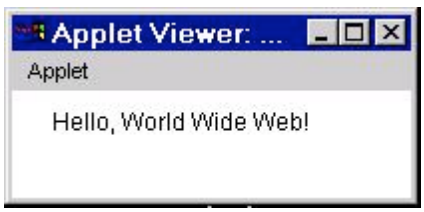
All you have to do is fill in the appropriate methods to bring your applet to life. If you don't need to use one or more of these predefined methods, simply leave them out of your applet. The applet will ignore messages from the browser attempting to invoke any of these methods that you don't use.

A Simple Applet

The following complete applet displays "Hello, World Wide Web!" in your browser window:

```
import java.applet.Applet;
import java.awt.Graphics;
public class TrivialApplet extends Applet {
public void paint(Graphics g) {
// display a string at 20,
// where 0,0 is the upper-left corner
g.drawString("Hello, World Wide Web!", 20, 20);
}
}
```

An appletviewer may be used instead of a WWW browser to test applets. For example, the output of TrivialApplet on an appletviewer looks like:



Declarations

A Java variable may refer to an object, an array, or an item of primitive type. Variables are defined using the following simple syntax: TypeName variableName;

For example,
int a; // defines an integer
int[ ] b; // defines a reference to array of ints
Vector v; // reference to a Vector object

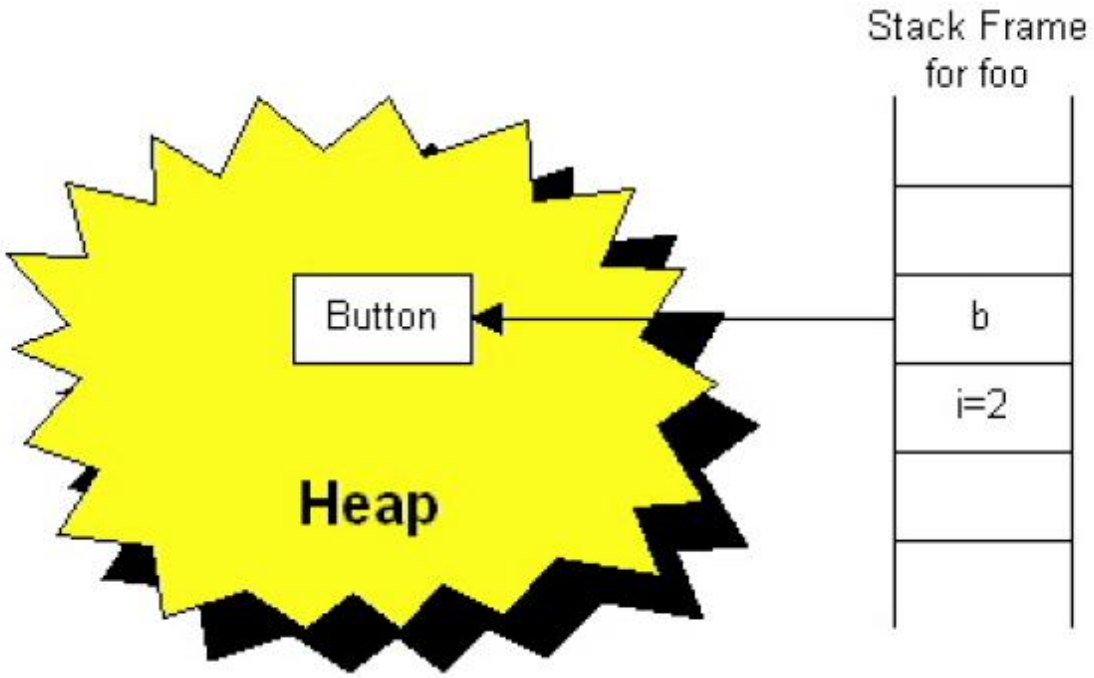
Primitive Types
The Java language has the following primitive types:

Primitive Type	*Description*
`boolean`	`true/false`
`byte`	8 bits
`char`	16 bits (UNICODE)
`short`	16 bits
`int`	32 bits
`long`	64 bits
`float`	32 bits IEEE 754-1985
`double`	64 bits IEEE 754-1985

Java int types may **not** be used as boolean types and are always signed.

Objects
A simple C++ object or C struct definition such as "Button b;" allocates memory on the stack for a Button object and makes b refer to it. By contrast, you must specifically instantiate Java objects with the new operator. For example,

```
// Java code
void foo( ) {
// define a reference to a Button; init to null
Button b;
// allocate space for a Button, b points to it
b = new Button("OK");
int i = 2;
}
```



As the accompanying figure shows, this code places a reference b to the Buttonobject on the stack and allocates memory for the new object on the heap.
The equivalent C++ and C statements that would allocate memory on the heap would be:

```
// C++ code
Button *b = NULL; // declare a new Button pointer
b = new Button("OK"); // point it to a new Button
/* C code */
Button *b = NULL; /* declare a new Button pointer */
b = calloc(1, sizeof(Button)); /* allocate space for a Button */
init(b, "OK"); /* something like this to init b */
```

All Java objects reside on the heap; there are no objects stored on the stack. Storing objects on the heap does not cause potential memory leakage problems because of garbage collection. Each Java primitive type has an equivalent object type, e.g., Integer, Byte,
Float, Double. These primitive types are provided in addition to object types purely for efficiency. An int is much more efficient than an Integer.

Operators
The Java language has added the >>> zero-extend right-shift operator to the set of C++ operators. (C++ operators include instanceof and new, which are not present in C. Note that sizeof has been removed, as memory allocation is handled for you.) The operators, in order of highest to lowest priority, are:

- new
- .
- -- ++ + - ~ ! (TypeName)
- * / %
- + -
- << >> >>>
- < > <= >= instanceof
- == !=
- &
- ^

• |
• &&
• ||
• ?:
• = *= /= %= += -= <<= >>= >>>= &= ^= |=

Note that the precedence of the new operator and the '.' operator bind differently than in C++. A proper Java statement is:

// Java code
new T().method();
In C++, you would use:
// C++ code
(new T)->method();

Statements
Java statements are similar to those in C/C++ as the following table shows.

Forms of Common Statements

Statement	*Examples*
if	`if (boolean-expr) stat1` `if (boolean-expr) stat1 else stat2`

switch	`switch (int-expr) {`
	`case int-const-expr : stat1`
	`case int-const-expr : stat2`
	`default : stat3`
	`}`

for	`for (int i=0; i<10; i++) stat`
while	`while (boolean-expr) stat`
do-while	`do { stats } while (boolean-expr)`
return	`return expr;`

The Java break and continue statements may have labels. These labels refer to the specific loop that the break or continue apply to. (Each loop can be preceded by a label.)

C & C++ PROGRAMMING

C – Language History

C language is a structure oriented programming language, was developed at Bell Laboratories in 1972 by Dennis Ritchie

- C language features were derived from earlier language called "B" (Basic Combined Programming Language – BCPL)
- C language was invented for implementing UNIX operating system
- In 1978, Dennis Ritchie and Brian Kernighan published the first edition "The C Programming Language" and commonly known as K&R C
- In 1983, the American National Standards Institute (ANSI) established a committee to provide a modern, comprehensive definition of C. The resulting definition, the ANSI standard, or "ANSI C", was completed late 1988.

C standards

- **C89/C90 standard** – First standardized specification for C language was developed by American National Standards Institute in 1989. C89 and C90 standards refer to the same programming language.
- **C99 standard** – Next revision was published in 1999 that introduced new futures like advanced data types and other changes.

C11 and Embedded C

- C11 standard adds new features to C and library like type generic macros, anonymous structures, improved Unicode support, atomic operations, multi-threading, and bounds-checked functions. It also makes some portions of the existing C99 library optional, and improves compatibility with C++.
- Embedded C includes features not available in normal C like fixed-point arithmetic, named address spaces, and basic I/O hardware addressing
- Operating systems, C compiler and all UNIX application programs are written in C language
- It is also called as procedure oriented programming language
- C language is reliable, simple and easy to use.
- C has been coded in assembly language

Features of C language:

- Reliability
- Portability
- Flexibility
- Interactivity
- Modularity
- Efficiency and Effectiveness

Uses of C language:

C language is used for developing system applications that forms major portion of operating systems such as Windows, UNIX and Linux. Below are some examples of C being used.

- Database systems
- Graphics packages
- Word processors
- Spread sheets
- Operating system development
- Compilers and Assemblers
- Network drivers
- Interpreters

Which level the C language is belonging to?

S.no	High Level	Middle Level	Low Level
1	High level languages provides almost everything that the programmer might need to do as already built into the language	Middle level languages don't provide all the built-in functions found in high level languages, but provides all building blocks that we need to produce the result we want	Low level languages provides nothing other than access to the machines basic instruction set
2	Examples: Java, Python	C, C++	Assembler

C language is a structured language

S.no	Structure oriented	Object oriented	Non structure
1	In this type of language, large programs are divided into small programs called functions	In this type of language, programs are divided into objects	There is no specific structure for programming this language
2	Prime focus is on functions and procedures that operate on data	Prime focus is on the data that is being operated and not on the functions or procedures	N/A
3	Data moves freely around the systems from one function to another	Data is hidden and cannot be accessed by external functions	N/A
4	Program structure follows "Top Down Approach"	Program structure follows "Bottom UP Approach"	N/A
5	Examples: C, Pascal, ALGOL and Modula-2	C++, JAVA and C# (C sharp)	BASIC, COBOL, FORTRAN

Key points to remember:

1. C language is structured, middle level programming language developed by Dennis Ritchie
2. Operating system programs such as Windows, Unix, Linux are wriiten by C language
3. C89/C90 and C99 are two standardized editions of C language
4. C has been written in assembly language

C – printf and scanf

Prev Next

- printf() and scanf() functions are inbuilt library functions in C which are available in C library by default. These functions are declared and related macros are defined in "stdio.h" which is a header file.
- We have to include "stdio.h" file as shown in below C program to make use of these printf() and scanf() library functions.

C – printf and scanf

* printf() and scanf() functions are inbuilt library functions in C which are available in C library by default. These functions are declared and related macros are defined in "stdio.h" which is a header file.
* We have to include "stdio.h" file as shown in below C program to make use of these printf() and scanf() library functions.

1**. C printf() function:**

o printf() function is used to print the "character, string, float, integer, octal and hexadecimal values" onto the output screen.

o We use printf() function with %d format specifier to display the value of an integer variable.

o Similarly %c is used to display character, %f for float variable, %s for string variable, %lf for double and %x for hexadecimal variable.

o To generate a newline,we use "\n" in C printf() statement.

Note:

o C language is case sensitive. For example, printf() and scanf() are different from Printf() and Scanf(). All characters in printf() and scanf() functions must be in lower case.

Example program for C printf() function:

```
#include <stdio.h>
 int main( )
{
char ch = 'A';
char str[20] = "fresh2refresh.com";
 float flt = 10.234;
 int no = 150;
double dbl = 20.123456;
printf("Character is %c \n", ch);
printf("String is %s \n" , str);
printf("Float value is %f \n", flt);
printf("Integer value is %d\n" , no);
printf("Double value is %lf \n", dbl);
printf("Octal value is %o \n", no);
printf("Hexadecimal value is %x \n", no); return 0; }
```

```
#include <stdio.h>
```

```
int main( )
{
  char  ch = 'A';
  char  str[20] = "fresh2refresh.com";
  float flt = 10.234;
  int no = 150;

  double dbl = 20.123456;
  printf("Character is %c \n", ch);
  printf("String is %s \n" , str);
  printf("Float value is %f \n", flt);
  printf("Integer value is %d\n" , no);

  printf("Double value is %lf \n", dbl);
  printf("Octal value is %o \n", no);
  printf("Hexadecimal value is %x \n", no);

  return 0;

}
```

Output:
Character is A
String is fresh2refresh.com
Float value is 10.234000
Integer value is 150
Double value is 20.123456
Octal value is 226
Hexadecimal value is 96

You can see the output with the same data which are placed within the double quotes of printf statement in the program except

- %d got replaced by value of an integer variable (no),
- %c got replaced by value of a character variable (ch),
- %f got replaced by value of a float variable (flt),
- %lf got replaced by value of a double variable (dbl),
- %s got replaced by value of a string variable (str),
- %o got replaced by a octal value corresponding to integer variable (no),
- %x got replaced by a hexadecimal value corresponding to integer variable
- \n got replaced by a newline.

2. C scanf() function:

- scanf() function is used to read character, string, numeric data from keyboard
- Consider below example program where user enters a character. This value is assigned to the variable “ch” and then displayed.
- Then, user enters a string and this value is assigned to the variable ”str” and then displayed.

Example program for printf() and scanf() functions in C:

```
#include <stdio.h>
 int main( )
 {
 char ch;
char str[100];
printf("Enter any character \n");
scanf("%c", &ch);
printf("Entered character is %c \n", ch);
printf("Enter any string ( upto 100 character ) \n");
scanf("%s", &str);
printf("Entered string is %s \n", str); }
```

```
#include <stdio.h>

int main( )
{
   char ch;
   char str[100];

   printf("Enter any character \n");
   scanf("%c", &ch);
   printf("Entered character is %c \n", ch);

   printf("Enter any string ( upto 100 character ) \n");
   scanf("%s", &str);
   printf("Entered string is %s \n", str);
}
```

Output:

```
Enter any character
a
Entered character is a
Enter any string ( upto 100 character )
hai
Entered string is hai
```

- The format specifier %d is used in scanf() statement. So that, the value entered is received as an integer and %s for string.
- Ampersand is used before variable name “ch” in scanf() statement as &ch.

DATA TYPE

- C data types are defined as the data storage format that a variable can store a data to perform a specific operation.
- Data types are used to define a variable before to use in a program.
- Size of variable, constant and array are determined by data types.

C – data types:

There are four data types in C language. They are,

S.no	Types	Data Types
1	Basic data types	int, char, float, double
2	Enumeration data type	enum
3	Derived data type	pointer, array, structure, union
4	Void data type	void

Basic data types in C:

Integer data type:

- Integer data type allows a variable to store numeric values.
- "int" keyword is used to refer integer data type.
- The storage size of int data type is 2 or 4 or 8 byte.
- It varies depend upon the processor in the CPU that we use. If we are using 16 bit processor, 2 byte (16 bit) of memory will be allocated for int data type.
- Like wise, 4 byte (32 bit) of memory for 32 bit processor and 8 byte (64 bit) of memory for 64 bit processor is allocated for int datatype.
- int (2 byte) can store values from -32,768 to +32,767
- int (4 byte) can store values from -2,147,483,648 to +2,147,483,647.
- If you want to use the integer value that crosses the above limit, you can go for "long int" and "long long int" for which the limits are very high.

Note:

- We can't store decimal values using int data type.
- If we use int data type to store decimal values, decimal values will be truncated and we will get only whole number.
- In this case, float data type can be used to store decimal values in a variable.

Character data type:

- Character data type allows a variable to store only one character.
- Storage size of character data type is 1. We can store only one character using character data type.
- "char" keyword is used to refer character data type.
- For example, 'A' can be stored using char datatype. You can't store more than one character using char data type.
- Please refer C – Strings topic to know how to store more than one characters in a variable.

Floating point data type:

Floating point data type consists of 2 types. They are,

1. float
2. double

float:

- Float data type allows a variable to store decimal values.
- Storage size of float data type is 4. This also varies depend upon the processor in the CPU as "int" data type.
- We can use up-to 6 digits after decimal using float data type.
- For example, 10.456789 can be stored in a variable using float data type.

double:

- Double data type is also same as float data type which allows up-to 10 digits after decimal.
- The range for double datatype is from 1E–37 to 1E+37.

sizeof() function in C:

sizeof() function is used to find the memory space allocated for each C data types.

```
#include <stdio.h>
#include <limits.h>

int main( )
{

  int a;
  char b;
  float c;
  double d;
  printf("Storage size for int data type:%d \n",sizeof(a) );
  printf("Storage size for char data type:%d \n",sizeof(b) );
  printf("Storage size for float data type:%d \n",sizeof(c) );
  printf("Storage size for double data type:%d\n",sizeof(d) );
  return 0;
}
```

Modifiers in C:

- The amount of memory space to be allocated for a variable is derived by modifiers.
- Modifiers are prefixed with basic data types to modify (either increase or decrease) the amount of storage space allocated to a variable.
- For example, storage space for int data type is 4 byte for 32 bit processor. We can increase the range by using long int which is 8 byte. We can decrease the range by using short int which is 2 byte.
- There are 5 modifiers available in C language. They are,
    1. short
    2. long
    3. signed
    4. unsigned
    5. long long
- Below table gives the detail about the storage size of each C basic data type in 16 bit processor. Please keep in mind that storage size and range for int and float datatype will vary depend on the CPU processor (8,16, 32 and 64 bit)

S.No	C Data types	storage Size	Range
1	char	1	–127 to 127
2	int	2	–32,767 to 32,767
3	float	4	1E–37 to 1E+37 with six digits of precision
4	double	8	1E–37 to 1E+37 with ten digits of precision
5	long double	10	1E–37 to 1E+37 with ten digits of precision
6	long int	4	–2,147,483,647 to 2,147,483,647
7	short int	2	–32,767 to 32,767
8	unsigned short int	2	0 to 65,535
9	signed short int	2	–32,767 to 32,767
10	long long int	8	–(2power(63) –1) to 2(power)63 –1
11	signed long int	4	–2,147,483,647 to 2,147,483,647
12	unsigned long int	4	0 to 4,294,967,295
13	unsigned long long int	8	2(power)64 –1

Keywords in C language:

- Keywords are pre-defined words in a C compiler.

- Each keyword is meant to perform a specific function in a C program.
- Since keywords are referred names for compiler, they can't be used as variable name.

C language supports 32 keywords which are given below. Click on each keywords below for detail description and example programs.

auto	double	int	struct
break	else	long	switch
case	enum	register	typedef
char	extern	return	union
const	float	short	unsigned
continue	for	signed	void
default	goto	sizeof	volatile
do	if	static	while

C Constants

- **C Constants** are also like normal variables. But, only difference is, their values can not be modified by the program once they are defined.
- Constants refer to fixed values. They are also called as literals
- Constants may be belonging to any of the data type.
- Syntax:

const data_type variable_name; (or) const data_type *variable_name;

Types of C constant:

1. Integer constants
2. Real or Floating point constants
3. Octal & Hexadecimal constants
4. Character constants
5. String constants
6. Backslash character constants

S.no	Constant type	data type	Example
1	Integer constants	int unsigned int long int long long int	53, 762, -478 etc 5000u, 1000U etc 483,647 2,147,483,680
2	Real or Floating point constants	float doule	10.456789 600.123456789
3	Octal constant	int	013 /* starts with 0 */
4	Hexadecimal constant	int	0×90 /* starts with 0x */
5	character constants	char	'A' , 'B', 'C'
6	string constants	char	"ABCD" , "Hai"

Rules for constructing C constant:

1. Integer Constants in C:

- An integer constant must have at least one digit.
- It must not have a decimal point.
- It can either be positive or negative.
- No commas or blanks are allowed within an integer constant.
- If no sign precedes an integer constant, it is assumed to be positive.

- The allowable range for integer constants is -32768 to 32767.

2. Real constants in C:

- A real constant must have at least one digit
- It must have a decimal point
- It could be either positive or negative
- If no sign precedes an integer constant, it is assumed to be positive.
- No commas or blanks are allowed within a real constant.

3. Character and string constants in C:

- A character constant is a single alphabet, a single digit or a single special symbol enclosed within single quotes.
- The maximum length of a character constant is 1 character.
- String constants are enclosed within double quotes.

4. Backslash Character Constants in C:

- There are some characters which have special meaning in C language.
- They should be preceded by backslash symbol to make use of special function of them.
- Given below is the list of special characters and their purpose.

Backslash character	Meaning
\b	Backspace
\f	Form feed
\n	New line
\r	Carriage return
\t	Horizontal tab
\"	Double quote
\'	Single quote
\\	Backslash
\v	Vertical tab
\a	Alert or bell
\?	Question mark
\N	Octal constant (N is an octal constant)
\XN	Hexadecimal constant (N – hex.dcml cnst)

C++

C++ is a middle-level programming language developed by Bjarne Stroustrup starting in 1979 at Bell Labs. C++ runs on a variety of platforms, such as Windows, Mac OS, and the various versions of UNIX.

Overview

C++ is a statically typed, compiled, general-purpose, case-sensitive, free-form programming language that supports procedural, object-oriented, and generic programming.
C++ is regarded as a **middle-level** language, as it comprises a combination of both high-level and low-level language features.
C++ was developed by Bjarne Stroustrup starting in 1979 at Bell Labs in Murray Hill, New Jersey, as an enhancement to the C language and originally named C with Classes but later it was renamed C++ in 1983.
C++ is a superset of C, and that virtually any legal C program is a legal C++ program.
Note: A programming language is said to use static typing when type checking is performed during compile-time as opposed to run-time.

Object-Oriented Programming

C++ fully supports object-oriented programming, including the four pillars of object-oriented development:
☐ Encapsulation
☐ Data hiding
☐ Inheritance
☐ Polymorphism

Standard Libraries

Standard C++ consists of three important parts:
☐ The core language giving all the building blocks including variables, data types and literals, etc.
☐ The C++ Standard Library giving a rich set of functions manipulating files, strings, etc.
☐ The Standard Template Library (STL) giving a rich set of methods manipulating data structures, etc.

Use of C++

C++ is used by hundreds of thousands of programmers in essentially every application domain.
C++ is being highly used to write device drivers and other softwares that rely on direct manipulation of hardware under realtime constraints.
C++ is widely used for teaching and research because it is clean enough for successful teaching of basic concepts.
Anyone who has used either an Apple Macintosh or a PC running Windows has indirectly used C++ because the primary user interfaces of these systems are written in C++

C++ Basic Syntax

When we consider a C++ program, it can be defined as a collection of objects that communicate via invoking each other's methods. Let us now briefly look into what do class, object, methods and instant variables mean.

☐ **Object -** Objects have states and behaviors. Example: A dog has states - color, name, breed as well as behaviors - wagging, barking, eating. An object is an instance of a class.
☐ **Class -** A class can be defined as a template/blueprint that describes the behaviors/states that object of its type support.
☐ **Methods -** A method is basically a behavior. A class can contain many methods. It is in methods where the logics are written, data is manipulated and all the actions are executed.
☐ **Instant Variables -** Each object has its unique set of instant variables. An object's state is created by the values assigned to these instant variables.

C++ Program Structure:

Let us look at a simple code that would print the words Hello World.

```
#include<iostream>
usingnamespace std;
```

```
// main( ) is where program execution begins.
int main( )
{
cout <<"Hello World";// prints Hello World
return0;
}
```

Let us look various parts of the above program:

☐ The C++ language defines several headers, which contain information that is either necessary or useful to your program. For this program, the header **<iostream>** is needed.
☐ The line **using namespace std;** tells the compiler to use the std namespace. Namespaces are a relatively recent addition to C++.
☐ The next line **// main() is where program execution begins.** is a single-line comment available in C++. Single-line comments begin with // and stop at the end of the line.
☐ The line **int main()** is the main function where program execution begins.
☐ The next line **cout << "This is my first C++ program.";** causes the message "This is my first C++ program" to be displayed on the screen.
☐ The next line **return 0;** terminates main( )function and causes it to return the value 0 to the calling process.

C++ Identifiers:
A C++ identifier is a name used to identify a variable, function, class, module, or any other user-defined item. An identifier starts with a letter A to Z or a to z or an underscore (_) followed by zero or more letters, underscores, and digits (0 to 9).
C++ does not allow punctuation characters such as @, $, and % within identifiers. C++ is a case-sensitive programming language. Thus, **Manpower** and **manpower** are two different identifiers in C++.

Here are some examples of acceptable identifiers:
Mohd zara abc move_ name a_123
myname50 _temp j a23b9 retVal

C++ Keywords:
The following list shows the reserved words in C++. These reserved words may not be used as constant or variable or any other identifier names

Asm	else	new	this
Auto	enum	operator	throw
Bool	explicit	private	true
Break	export	protected	try
Case	extern	public	typedef
Catch	false	register	typeid
Char	float	reinterpret_cast	typename
Class	for	return	union
Const	friend	short	unsigned
const_cast	goto	signed	using
continue	If	sizeof	virtual
Default	inline	Static	void
Delete	int	static_cast	volatile
Do	long	Struct	wchar_t
Double	mutable	Switch	while
dynamic_cast	namespace	Template	

NUMBER SYSTEM

A digital system can understand positional number system only where there are only a few symbols called dig its and these symbols represent different values depending on the position they occupy in the number.
A value of each dig it in a number can be determined using
The digit
The position of the dig it in the number
The base of the number system (where base is defined as the total number of dig its available in the number system).

Decimal Number System
The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 as it uses 10 dig its from 0 to 9. In decimal number system, the successive positions to the left of the decimal point represent units, tens, hundreds, thousands and so on.
Each position represents a specific power of the base (10). For example, the decimal number 1234 consists of the dig it 4 in the units position, 3 in the tens position, 2 in the hundreds position, and 1 in the thousands position, and its value can be written as

(1x1000)+ (2x100)+ (3x10)+ (4xl)
1000 + 200 + 30 + 1
1234

As a computer programmer or an IT professional, you should understand the following number systems which are frequently used in computers.

S.N.	Number System & Description
1	**Binary Number System** Base 2. Dig its used: 0, 1
2	**Octal Number System** Base 8. Dig its used: 0 to 7
4	**Hexa Decimal Number System** Base 16. Dig its used: 0 to 9, Letters used: A- F

Binary Number System
Characteristics
Uses two dig its, 0 and 1.
Also called base 2 number system
Each position in a binary number represents a 0 power of the base (2). Example 20
Last position in a binary number represents a x power of the base (2). Example 2x where x represents the last position - 1.
Example
Binary Number: 101012
Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	10101_2	$((1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	10101_2	$(16 + 0 + 4 + 0 + 1)_{10}$
Step 3	10101_2	21_{10}

Octal Number System
Characteristics
Uses eig ht dig its, 0,1,2,3,4,5,6,7.
Also called base 8 number system
Each position in a octal number represents a 0 power of the base (8). Example 80
Last position in a octal number represents a x power of the base (8). Example 8x where x represents the last position - 1.
Example
Octal Number: 125708
Calculating Decimal Equivalent

Step	Octal Number	Decimal Number
Step 1	12570_8	$((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0))_{10}$
Step 2	12570_8	$(4096 + 1024 + 320 + 56 + 0)_{10}$
Step 3	12570_8	5496_{10}

Hexadecimal Number System
Characteristics
Uses 10 dig its and 6 letters, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.
Letters represents numbers starting from 10. A = 10. B = 11, C = 12, D = 13, E = 14, F = 15.
Also called base 16 number system
Each position in a hexadecimal number represents a 0 power of the base (16). Example 160
Last position in a hexadecimal number represents a x power of the base (16). Example 16x where x represents the last position - 1.
Example
Hexadecimal Number: 19FDE16
Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (F \times 16^2) + (D \times 16^1) + (E \times 16^0))_{10}$
Step 2	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (15 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))_{10}$
Step 3	$19FDE_{16}$	$(65536 + 36864 + 3840 + 208 + 14)_{10}$
Step 4	$19FDE_{16}$	106462_{10}

BINARY ARITHMETIC
Binary arithmetic is essential part of all the digital computers and many other digital system.
Binary Addition
It is a key for binary subtraction, multiplication, division. There four rules of the binary addition.

Case	A + B	Sum	Carry
1	0 + 0	0	0
2	0 + 1	1	0
3	1 + 0	1	0
4	1 + 1	0	1

In fourth case, a binary addition is creating a sum of (1+1=10) i.e. 0 is write in the given column and a carry of 1 over to the next column.

Example – Addition

0011010 + 001100 = 00100110

```
  1 1          carry
  0 0 1 1 0 1 0  = 26(10)
+ 0 0 0 1 1 0 0  = 12(10)
-----------------
  0 1 0 0 1 1 0  = 38(10)
```

Binary Subtraction

Subtraction and Borrow, these two words will be used very frequently for the binary subtraction.There four rules of the binary substration.There four rules of the binary Subtraction.

Case	A - B	Subtract	Borrow
1	0 - 0	0	0
2	1 - 0	1	0
3	1 - 1	0	0
4	0 - 1	0	1

Example - Subtraction

0011010 - 001100 = 00001110

```
    1 1        borrow
  0 0 1 1 0 1 0  = 26(10)
- 0 0 0 1 1 0 0  = 12(10)
-----------------
  0 0 0 1 1 1 0  = 14(10)
```

Binary Multiplication

Binary multiplication is similar to decimal multiplication. It is simpler than decimal multiplication because only 0s and 1s are involved.There four rules of the binary multiplication.

Case	A x B	Multiplication
1	0 x 0	0
2	0 x 1	0
3	1 x 0	0
4	1 x 1	1

Example – Multiplication

Example:

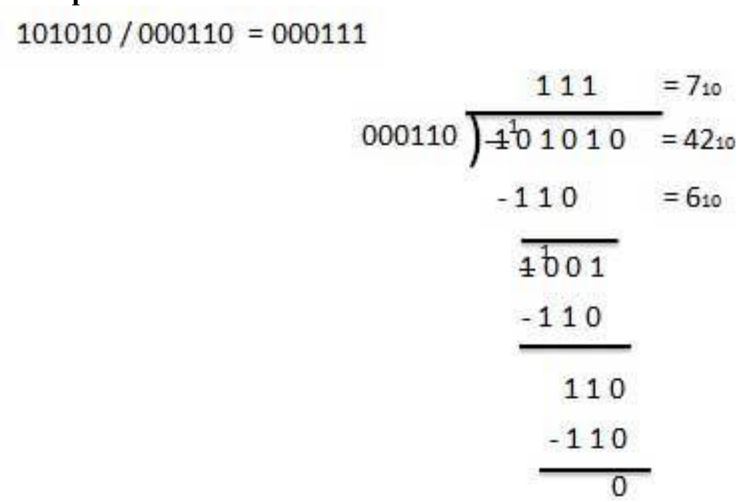
0011010 x 001100 = 100111000

```
    0 0 1 1 0 1 0  = 26(10)
  x 0 0 0 1 1 0 0  = 12(10)
-------------------
    0 0 0 0 0 0 0
  0 0 0 0 0 0 0
0 0 1 1 0 1 0
0 0 1 1 0 1 0
-------------------
0 1 0 0 1 1 1 0 0 0  = 312(10)
```

Binary Division

Binary division is similar to decimal division. It is called as the long division procedure.

Example – Division



BINARY CODES

In the coding, when numbers, letters or words are represented by a specific group of symbols, it is said that the number, letter or word is being encoded. The group of symbols is called as a code. The digital data is represented, stored and transmitted as group of binary bits. This group is also called as **binary code**. The binary code is represented by the number as well as alphanumeric letter.

Advantages of Binary Code

Following is the list of advantages that binary code offers.

- Binary codes are suitable for the computer applications.
- Binary codes are suitable for the digital communications.
- Binary codes make the analysis and designing of digital circuits if we use the binary codes.
- Since only 0 & 1 are being used, implementation becomes easy.

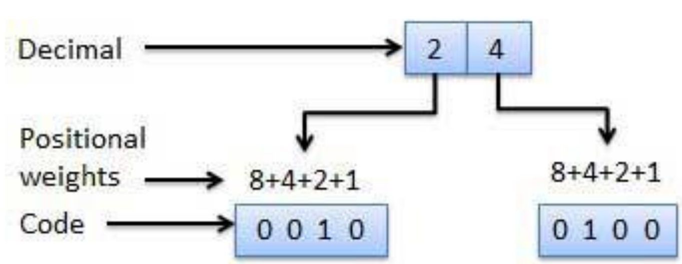
Classification of binary codes

The codes are broadly categorized into following four categories.

- Weighted Codes
- Non-Weighted Codes
- Binary Coded Decimal Code
- Alphanumeric Codes
- Error Detecting Codes
- Error Correcting Codes
-

Weighted Codes

Weighted binary codes are those binary codes which obey the positional weight principle. Each position of the number represents a specific weight. Several systems of the codes are used to express the decimal digits 0 through 9. In these codes each decimal digit is represented by a group of four bits.

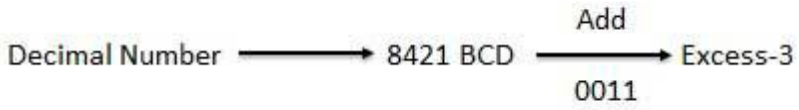


Non-Weighted Codes

In this type of binary codes, the positional weights are not assigned. The examples of non-weighted codes are Excess-3 code and Gray code.

Excess-3 code

The Excess-3 code is also called as XS-3 code. It is non-weighted code used to express decimal numbers. The Excess-3 code words are derived from the 8421 BCD code words adding (0011)2 or (3)10 to each code word in 8421. The excess-3 codes are obtained as follows



Example

Decimal	BCD 8 4 2 1	Excess-3 BCD + 0011
0	0 0 0 0	0 0 1 1
1	0 0 0 1	0 1 0 0
2	0 0 1 0	0 1 0 1
3	0 0 1 1	0 1 1 0
4	0 1 0 0	0 1 1 1
5	0 1 0 1	1 0 0 0
6	0 1 1 0	1 0 0 1
7	0 1 1 1	1 0 1 0
8	1 0 0 0	1 0 1 1
9	1 0 0 1	1 1 0 0

Gray Code

It is the non-weighted code and it is not arithmetic codes. That means there are no specific weights assigned to the bit position. It has a very special feature that has only one bit will change, each time the decimal number is incremented as shown in fig. As only one bit changes at a time, the gray code is called as a unit distance code. The gray code is a cyclic code. Gray code cannot be used for arithmetic operation.

Decimal	BCD	Gray
0	0 0 0 0	0 0 0 0
1	0 0 0 1	0 0 0 1
2	0 0 1 0	0 0 1 1
3	0 0 1 1	0 0 1 0
4	0 1 0 0	0 1 1 0
5	0 1 0 1	0 1 1 1
6	0 1 1 0	0 1 0 1
7	0 1 1 1	0 1 0 0
8	1 0 0 0	1 1 0 0
9	1 0 0 1	1 1 0 1

Application of Gray code

Gray code is popularly used in the shaft position encoders.

A shaft position encoder produces a code word which represents the angular position of the shaft.

Binary Coded Decimal (BCD) code

In this code each decimal digit is represented by a 4-bit binary number. BCD is a way to express each of the decimal digits with a binary code. In the BCD, with four bits we can represent sixteen numbers (0000 to 1111). But in BCD code only first ten of these are used (0000 to 1001). The remaining six code combinations i.e. 1010 to 1111

are invalid in BCD.

Decimal	0	1	2	3	4	5	6	7	8	9
BCD	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

Advantages of BCD Codes
It is very similar to decimal system.
We need to remember binary equivalent of decimal numbers 0 to 9 only.

Disadvantages of BCD Codes
The addition and subtraction of BCD have different rules.
The BCD arithmetic is little more complicated.
BCD needs more number of bits than binary to represent the decimal number. So BCD is less efficient than binary.

Alphanumeric codes
A binary digit or bit can represent only two symbols as it has only two states '0' or '1'. But this is not enough for communication between two computers because there we need many more symbols for communication. These symbols are required to represent 26 alphabets with capital and small letters, numbers from 0 to 9 , punctuation marks and other symbols.

The alphanumeric codes are the codes that represent numbers and alphabetic characters. Mostly such codes also represent other characters such as symbol and various instructions necessary for conveying information. An alphanumeric code should at least represent 10 digits and 26 letters of alphabet i.e. total 36 items. The following three alphanumeric codes are very commonly used for the data representation.

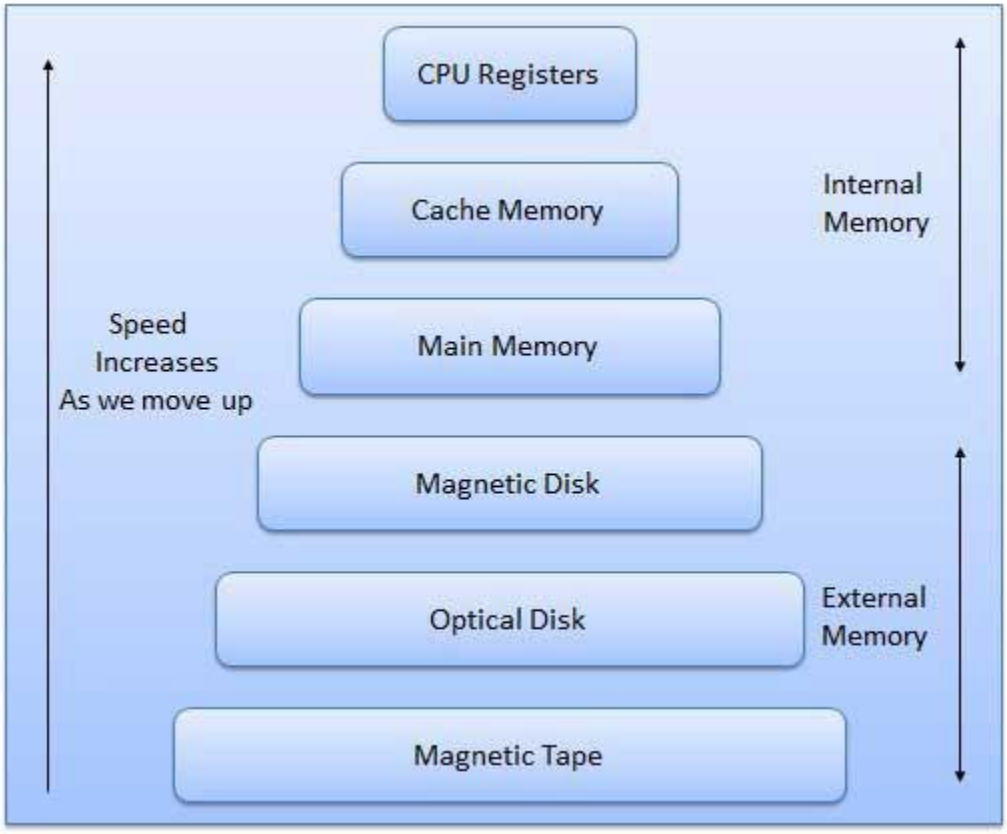
- American Standard Code for Information Interchange (ASCII).
- Extended Binary Coded Decimal Interchange Code (EBCDIC).
- Five bit Baudot Code.

ASCII code is a 7-bit code whereas EBCDIC is an 8-bit code. ASCII code is more commonly used worldwide while EBCDIC is used primarily in large IBM computers.

Error Codes
There are binary code techniques available to detect and correct data during data transmission.

MEMORY DEVICES

A memory is just like a human brain. It is used to store data and instruction. Computer memory is the storage space in computer where data is to be processed and instructions required for processing are stored.
The memory is divided into large number of small parts. Each part is called cell. Each location or cell has a unique address which varies from zero to memory size minus one.
For example if computer has 64k words, then this memory unit has 64 * 1024=65536 memory location. The address of these locations varies from 0 to 65535.
Memory is primarily of two types
Internal Memory - cache memory and primary/main memory
External Memory - magnetic disk / optical disk etc.



Characteristics of Memory Hierarchy are following when we go from top to bottom.

- Capacity in terms of storage increases.
- Cost per bit of storage decreases.
- Frequency of access of the memory by the CPU decreases.
- Access time by the CPU increases

RAM
memory. It is called random access memory (RAM).
Since access time in RAM is independent of the address to the word that is, each storage location inside the memory is as easy to reach as other location & takes the same amount of time. We can reach into the memory at random & extremely fast but can also be quite expensive.
RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence a backup uninterruptible power system(UPS) is often used with computers. RAM is small , both in terms of its physical size and in the amount of data it can hold.
RAM is of two types

1. Static RAM (SRAM)
2. Dynamic RAM (DRAM)

1. Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power remains applied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors.

Transistors do not require power to prevent leakage, so SRAM need not have to be refreshed on a regular basis. Because of the extra space in the matrix, SRAM uses more chips than DRAM for the same amount of storage space, thus making the manufacturing costs higher.
Static RAM is used as cache memory needs to be very fast and small.

2. **Dynamic RAM (DRAM)**

DRAM, unlike SRAM, must be continually **refreshed** in order for it to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory because it is cheap and small. All DRAMs are made up of memory cells. These cells are composed of one capacitor and one transistor.

ROM

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture.
A ROM, stores such instruction as are required to start computer when electricity is first turned on, this operation is referred to as bootstrap. ROM chip are not only used in the computer but also in other electronic items like washing machine and microwave oven.
Following are the varioys types of ROM

- **MROM (Masked ROM)**

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs. It is inexpensive ROM.

- **PROM (Programmable Read only Memory)**

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM programmer.Inside the PROM chip there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

- **EPROM(Erasable and Programmable Read Only Memory)**

The EPROM can be erased by exposing it to ultra-violet light for a duration of upto 40 minutes. Usually, a EPROM eraser achieves this function. During programming an electrical charge is trapped in an insulated gate region. The charge is retained for more than ten years because the charge has no leakage path. For erasing this charge, ultraviolet light is passed through a quartz crystal window(lid). This exposure to ultra-violet light dissipates the charge. During normal use the quartz lid is sealed with a sticker.

- **EEPROM(Electrically Erasable and Programmable Read Only Memory)**

The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (milli second). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of re-programming is flexible but slow.

1. **Serial Access Memory**

Sequential access means the system must search the storage device from the beginning of the memory address until it finds the required piece of data. Memory device which supports such access is called a Sequential Access Memory or Serial Access Memory. Magnetic tape is an example of serial access memory.

2. **Direct Access Memory**

Direct access memory or Random Access Memory, refers to condition in which a system can go directly to the information that the user wants. Memory device which supports such access is called a Direct Access Memory.

3. Magnetic disk, optical disks are an examples of direct access memory.

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory. It is used to hold those parts of data and program which are most frequently used by CPU. The parts of data and programs are transferred from disk to cache memory by operating system, from where CPU can access them.

Advantages

Cache memory is faster than main memory.

- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantages

Cache memory has limited capacity.

- It is very expensive.

Virtual memory is a technique that allows the execution of processes which are not completely available in memory. The main visible advantage of this scheme is that programs can be larger than physical memory. Virtual memory is the separation of user logical memory from physical memory.

This separation allows an extremely large virtual memory to be provided for programmers when only a smaller physical memory is available. Following are the situations, when entire program is not required to be loaded fully in main memory.

- User written error handling routines are used only when an error occured in the data or computation.
- Certain options and features of a program may be used rarely.
- Many tables are assigned a fixed amount of address space even though only a small amount of the table is actually used.
- The ability to execute a program that is only partially in memory would counter many benefits.
- Less number of I/O would be needed to load or swap each user program into memory.
- A program would no longer be constrained by the amount of physical memory that is available.
- Each user program could take less physical memory, more programs could be run the same time, with a corresponding increase in CPU utilization and throughput.

Auxiliary Memory

Auxiliary memory is much larger in size than main memory but is slower. It normally stores system programs, instruction and data files. It is also known as secondary memory. It can also be used as an overflow/virtual memory in case the main memory capacity has been exceeded. Secondary memories can not be accessed directly by a processor. First the data / information of auxillary memory is transferred to the main memory and then that information can be accessed by the CPU. Characteristics of Auxiliary Memory are following

- **Non-volatile memory** - Data is not lost when power is cut off.
- **Reusable** - The data stays in the secondary storage on permanent basis until it is not overwritten or deleted by the user.
- **Reliable** - Data in secondary storage is safe because of high physical stability of secondary storage device.
- **Convenience** - With the help of a computer software, authorised people can locate and access the data quickly.
- **Capacity** - Secondary storage can store large volumes of data in sets of multiple disks.
- **Cost** - It is much lesser expensive to store data on a tape or disk than primary memory.

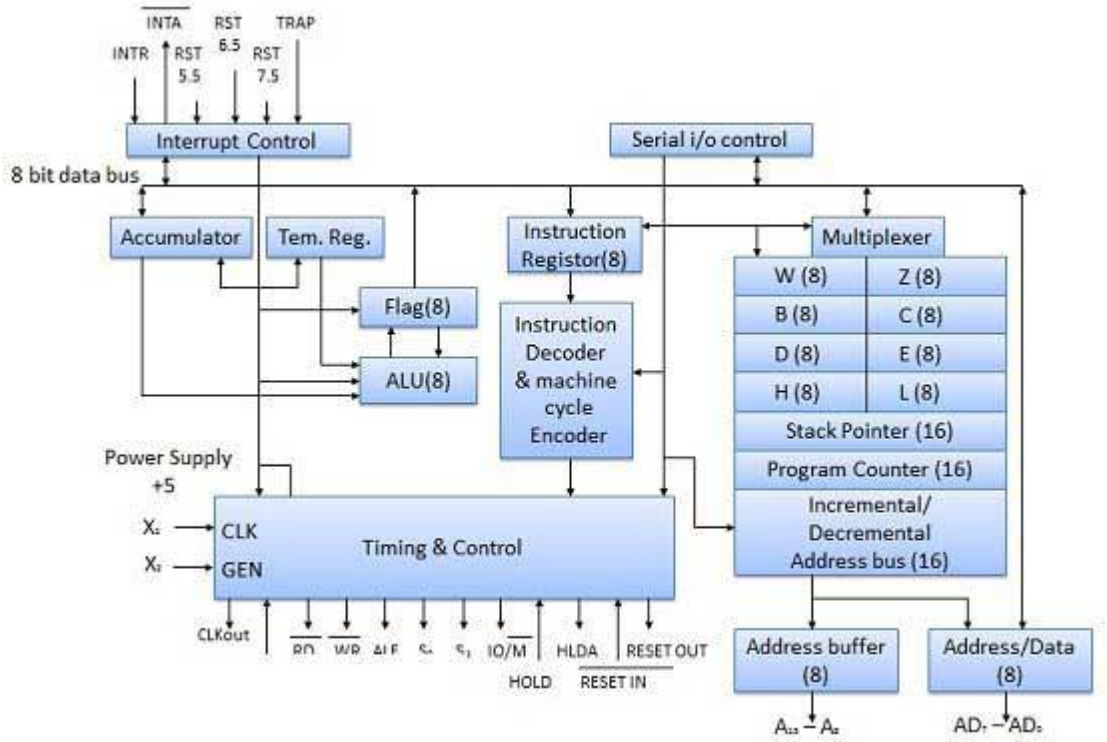
CPU ARCHITECTURE

Microprocessing unit is synonymous to central processing unit, CPU used in traditional computer. Microprocessor (MPU) acts as a device or a group of devices which do the following tasks. communicate with peripherals devices provide timing signal direct data flow perform computer tasks as specified by the instructions in memory

8085 Microprocessor

The 8085 microprocessor is an 8-bit general purpose microprocessor which is capable to address 64k of memory. This processor has forty pins, requires +5 V single power supply and a 3-MHz single-phase clock.

Block Diagram



ALU

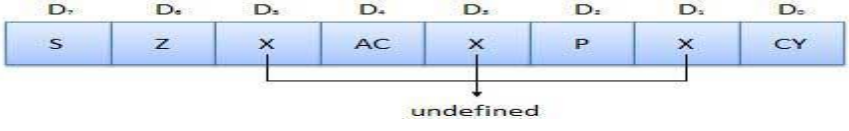
The ALU perform the computing function of microprocessor.It includes the accumulator, temporary register, arithmetic & logic circuit & and five flags. Result is stored in accumulator & flags.

Block Diagram

Accumulator

It is an 8-bit register that is part of ALU. This register is used to store 8-bit data & in performing arithmetic & logic operation. The result of operation is stored in accumulator.

Diagram



Flags

The register are programmable. It can be used to store and transfer the data from the registers by using instruction. The ALU includes five flip-flops that are set & reset acc. to data condition in accumulator and other registers.

- **S (Sign) flag** - After the execution of an arithmetic operation, if bit D7 of the result is 1, the sign flag is set. It is used to signed number. In a given byte, if D7 is 1 means negative number. If it is zero means it is a positive number.
- **Z (Zero) flag** - The zero flag is set if ALU operation result is 0.
- **AC (Auxiliary Carry) flag** - In arithmetic operation, when carry is generated by digit D3 and passed on to digit D4, the AC flag is set. This flag is used only internally BCD operation.
- **P (Parity) flag** - After arithmetic or logic operation, if result has even no. of 1s, the flag is set. If it has odd no. of 1s , flag is reset.
- **C (Carry) flag** - If arithmetic operation result in a carry, the carry flag is set, otherwise it is reset.

Register section

It is a basically storage device & transfer data from registers by using instruction.

Stack Pointer (SP) - The stack pointer is also a 16-bit register which is used as a memory pointer. It points to a memory location in Read/Write memory known as stack. In between execution of program, some time data to be stored in stack. The beginning of the stack is defined by loading a 16-bit address in the stack pointer.

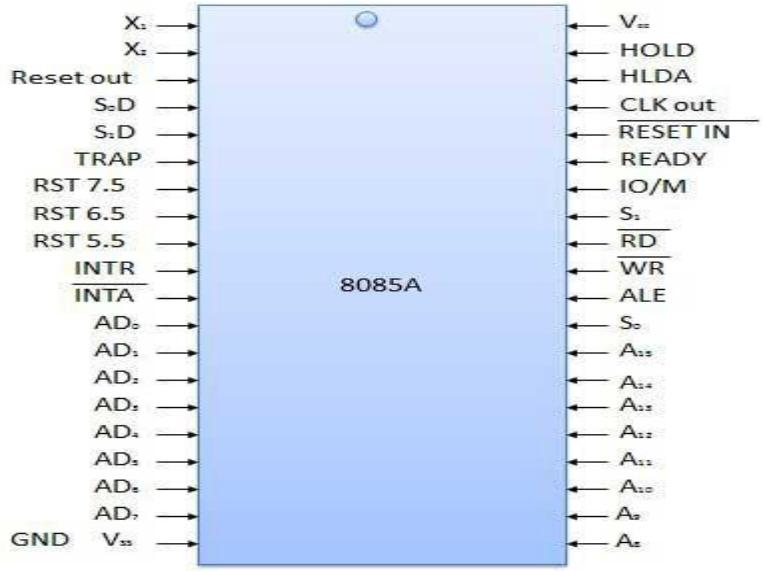
Program Counter (PC) - This 16-bit register deals with fourth operation to sequence the execution of instruction. This register is also a memory pointer. Memory location have 16-bit address. It is used to store the execution address. The function of the program counter is to point to memory address from which next bytes is to be fetched.

Storage registers -- Thes registers store 8-bit data during a program execution. These register are identified as B,C,D,E,H,L. They can be combined as register pair BC, DE and HL to perform some 16 bit operations.

Time and Control section

This unit is responsible to synchronize Microprocessor operation as per the clock pulse and to generate the control signals which are necessary for smooth communication between Microprocessor and peripherals devices. The RD bar and WR bar signal are syncronous pulses which indicates whether data is available on the data bus or not.The control unit is responsible to control the flow of data between microprocessor, memory and peripheral devices.

PIN DIAGRAM



All the signal can be classified into six groups

S.N.	Group	Description
1	**Address bus**	• The 8085 microprocessor has 8 signal line, A_{15} - A_8 which are unidirectional & used as a high order address bus.
2	**Data bus**	• The signal line AD7 - AD0 are bidirectional for dual purpose. They are used as low order address bus as well as data bus.
3	**Control signal and Status signal**	Control Signal • **RD bar -** It is a read control signal (active low). It is active then memory read the data. • **WR bar -** It is write control signal (active low). It is active when written into selected memory. Status signal • **ALU (Address Latch Enable) -** When ALU is high. 8085 microprocessor is use address bus. When ALU is low. 8085 microprocessor is use data bus. • **IO/M bar -** This is a status signal used to differentiate between i/o and memory operation. When it is high, it indicate an i/o operation and low, it indicate memory operation. • **S_1 and S_0 -** These status signal, similar to i/o and memory bar, can identify various operation, but they are rarely used in small system.
4	**Power supply and frequency signal**	• **V_{cc} -** +5v power supply. • **V_{ss} -** ground reference. • **X, X -** A crystal is connected at these two pins. The frequency is internally divided by two operate system at 3-MHz, the crystal should have a frequency of 6-MHz. • **CLK out -** This signal can be used as the system clock for other devices.
5	**Externally initiated signal**	• **INTR(i/p) -** Interrupt request. • **INTA bar (o/p) -** It is used as acknowledge interrupt. • **TRAP(i/p) -** This is non maskable interrupt and has highest priority. • **HOLD(i/p) -** It is used to hold the executing program. • **HLDA(o/p) -** Hold acknowledge. • **READY(i/p) -** This signal is used to delay the microprocessor read or write cycle until a slow responding peripheral is ready to accept or send data.

		• **RESET IN bar -** When the signal on this pin goes low, the program counter is set to zero, the bus are tri-stated, & MPU is reset. • **RESET OUT -** This signal indicate that MPU is being reset. The signal can be used to reset other devices. • **RST 7.5, RST 6.5, RST 5.5 (Request interrupt) -** It is used to transfer the program control to specific memory location. They have higher priority than INTR interrupt.
6	**Serial I/O ports**	• The 8085 microprocessor has two signals to implement the serial transmission serial input data and serial output data.

Instruction Format

Each instruction is represented by a sequence of bits within the computer. The instruction is divided into group of bits called field. The way of instruction is expressed is known as instruction format. It is usually represented in the form of rectangular box. The instruction format may be of the following types.

Variable Instruction Formats

These are the instruction formats in which the instruction length varies on the basis of opcode & address specifiers. For Example, VAX instruction vary between 1 and 53 bytes while X86 instruction vary between 1 and 17 bytes.

Format

Advantage

These formats have good code density.

Drawback

These instruction formats are very difficult to decode & pipeline.

Fixed Instruction Formats

In this type of instruction format, all instruction are same size. For Example, MIPS, Power PC, Alpha, ARM.

Format

Advantage

They are easy to decode & pipeline.

Drawback

They don't have as good code density.

Hybrid Instruction Formats

In this type of instruction formats, we have multiple format length specified by opcode.For example, IBM 360/70, MIPS 16, Thumb.

Format

Advantage
These compromise between code density & instruction of these type are very easy to decode.

Addressing Modes
Addressing mode provide different ways for access an address to given data to a processor. Operated data is stored in the memory location, each instruction required certain data on which it has operate. There are various techniques to specify address of data. These technique are called Addressing Modes.

1.Direct addressing mode - In the direct addressing mode, address of the operand is given in the instruction and data is available in the memory location which is provided in instruction. We will move this data in desired location.
2.Indirect addressing mode - In the indirect addressing mode, the instruction specifies a register which contain the address of the operand. Both internal RAM and external RAM can be access via indirect addressing mode.
3.Immediate addressing mode - In the immediate addressing mode, direct data is given in the operand which move the data in accumulator. It is very fast.
4.Relative addressing mode - In the relative address mode, the effective address is determined by the index mode by using the program counter in stead of general purpose processor register. This mode is called relative address mode.
5.Index addressing mode - In the index address mode, the effective address of the operand is generated by adding a content value to the contents of the register. This mode is called index address mode.

1. A floating point is said to be normalized if the most significant digit of the mantissa is—
   (A) Zero (B) Non-zero
   (C) Negative (D) Positive
   (E) None of the above

2. Which of the following application is suitable for FIFO Queue ?
   (A) An inventory of parts is to be processed by part number
   (B) A dictionary of words used by a spelling checker id to be created
   (C) A program to solve a maze is to back track to an earlier position when a dead end position is reached
   (D) A program to keep track of patients as the check into clinic, assigning them to doctors a first come, first served basis
   (E) None of the above

3. The field that investigates the mechanics of human intelligence is—
   (A) Artificial Science
   (B) Cognitive Science
   (C) Psychology
   (D) Sociology
   (E) None of the above

4. Which data structure is needed to convert infix notation to postfix notation ?
   (A) Branch (B) Queue
   (C) Tree (D) Stack
   (E) None of the above

5. Data are followed to be transmitted in only one direction in a—
   (A) Simplex Channel
   (B) Duplex Channel
   (C) Half-Duplex Channel
   (D) Full-Duplex Channel
   (E) None of the above

6. Which of the following statement is not true regarding graph ?
   (A) A graph consists of set of nodes and a set of arcs
   (B) A graph is a tree
   (C) A tree is a graph
   (D) Graphs can be directed
   (E) None of the above

7. Implementation of an inverted list to maintain the record list for each value for a given attribute can be done by—
   (A) Sequential file
   (B) Direct file
   (C) Indexed file
   (D) Indexed sequential
   (E) None of the above

8. A 6-MHz channel is used by digital signaling system utilizing 4-level signals. What is maximum possible transmission rate ?
   (A) 1·5 M band/sec
   (B) 6 M band/sec
   (C) 12 M band/sec
   (D) 24 M band/sec
   (E) None of the above

9. Which of the following is a type of ISDN (Integrated Services Digital Network) ?
   (A) Narrow Band
   (B) Broad Band
   (C) Both (A) and (B)
   (D) Medium Band
   (E) None of the above

10. Which of the following is easiest software development process model ?
    (A) Waterfall Model
    (B) Prototyping
    (C) Interactive enhancement
    (D) Spiral Model
    (E) None of the above

11. Which of the following feature is related to virtual circuit ?
    (A) Connection Oriented
    (B) Each packet sent is routed independently of its predecessors
    (C) Successive packets may follow different routes
    (D) Congestion control is difficult
    (E) None of the above

12. Which one of the following interrupt is non-makeable ?
    (A) TRAP (B) RST 7·5
    (C) INTR (D) RST 6·5
    (E) None of the above

13. Binding the same name to multiple operations whose signature differ in number or types of arguments ?
    (A) Overloading
    (B) Origin class
    (C) Object model
    (D) Package
    (E) None of the above

14. The C declaration in A[3][5] of containing ... elements is itself an array containing ... integers.
    (A) 3, 5 (B) 5, 3
    (C) 3, 3 (D) 5, 5
    (E) None of the above

15. What is the drawback of infrared and millimeter waves ?
    (A) They are directional
    (B) They cannot pass through solid objects
    (C) License is needed
    (D) Can be used outdoor
    (E) None of the above

16. Indexes created from a sequential (or sorted) set of primary keys are refered to as—
    (A) Indexed file organisation
    (B) Sequential file
    (C) Index sequential
    (D) All of the above
    (E) None of the above

17. A central computer surrounded by one or more satellite computers is called—
(A) Bus Network
(B) Ring Network
(C) Star Network
(D) All of the above
(E) None of the above

18. Which of the following is a major component of the telephone system ?
(A) Local loop
(B) Trunks
(C) Switching Office
(D) All of the above
(E) None of the above

19. A linear list of elements in which deletion can be done from one end and insertion can take place only at other end (rear) is known as—
(A) Queues (B) Stacks
(C) Trees (D) Branch
(E) None of the above

20. For tree, which of the following list traversing through the entire list is not necessary ?
(A) Circular list
(B) Singly linked list
(C) Doubly linked list
(D) Both (B) and (C)
(E) None of the above

21. Which of the following is not included in DML (Data Manipulation Language) ?
(A) INSERT
(B) UPDATE
(C) DELETE
(D) CAREATE
(E) None of the above

22. Which of the following communication service provides messages preparation and transmission facilities ?
(A) Teletex (B) Teletext
(C) X 400 (D) Fax
(E) None of the above

23. Which of the following schedular is in charge of handling the swapped out process ?
(A) Short term
(B) Medium term
(C) Long term
(D) Both (A) and (B)

24. Which of the following is not used as a data structure ?
(A) Arrary
(B) Linked List
(C) Graph
(D) Directory
(E) None of the above

25. Which of the following statement is not true in context of strings in C language ?
(A) It is array of characters
(B) Last character of character array is always '10'
(C) C inserts the null character automatically
(D) Any string in C can be read by the function get char '0'.
(E) None of the above

26. Which command will be used with vi editor to append text at end of line ?
(A) A (B) a
(C) i (D) I
(E) None of the above

27. Which the result of a computation depends on the speed of the processes involved there is said to be ?
(A) Cycle stealing
(B) Race condition
(C) A time look
(D) A dead lock
(E) None of the above

28. Which of the following feature is true regarding concatenated virtual circuits ?
(A) A sequence of virtual circuits is set up from source through one or more gateways to the destination
(B) Each gateway maintains table telling which virtual circle pass through it
(C) The scheme works best when all the networks have roughly the same properties
(D) All of the above
(E) None of the above

29. A compiler which runs on one machine and generates a code for another machine—
(A) Bootstrap
(B) Cross-compiler
(C) Lexical analyzer
(D) All of the above

30. Banker's algorithm for resource allocation deals with—
(A) Dead lock prevention
(B) Dead lock avoidance
(C) Dead lock recovery
(D) Mutual exclusion
(E) None of the above

31. A method, which transfers the entire block of data from its own buffer to main memory takes place without intervention by cup—
(A) Programmed input/output
(B) Interrupt driven input / output
(C) Direct Memory Access (DMA)
(D) Resident Monitor
(E) None of the above

32. Which the maximum clock rate is quoted for a logic family, it applies to a ?
(A) Shiftregister
(B) Flip-flop
(C) Counter
(D) Single logic gate
(E) None of the above

33. Which of the following table helps in representing the previous and next state of the sequential circuit prior to and after the clock pulse respectively?
(A) Truth table
(B) Characteristic table
(C) Excitation table
(D) Both (A) and (B)
(E) None of the above

34. A large computer information system maintains many different computer files. Which among them is called a perpetual file ?
(A) Specialized file
(B) Log file
(C) Master file
(D) History file
(E) None of the above

35. One method of programming a computer to exhibit intelligence is called modeling—
(A) Simulation
(B) Cognitization
(C) Psychic amelioration
(D) Duplication

36. In fiber optics the attenuation of light through glass depends on the—
(A) Wavelength of light
(B) Frequency of light
(C) Speed of light
(D) All of the above
(E) None of the above

37. Ap-channel enhancement type MOSFET performs much the same function a PNP Transistor except that—
(A) It operates much faster
(B) It is considerably larger
(C) It is controlled by voltage larger than current
(D) It is controlled by current rather than a voltage like a bipolar transistor
(E) None of the above

38. Among directory entry-node and file contents, which will be changed when a file is updated ?
(A) Only directory entry and file contents
(B) Only inode and file contents
(C) Both (A) and (B)
(D) Only directory entry
(E) None of the above

39. Which of the following is an important component of semantic analysis ?
(A) Symbol table
(B) Type checking
(C) Lex
(D) Yacc
(E) None of the above

40. Which of the following systems implementation approaches should be used if you want to run the old system and the new system at the same time for a specified period ?
(A) Direct (B) Pilot
(C) Phased (D) Parallel
(E) None of the above

41. Which of the following derivation does a top-down parser ? The input is assumed to be scanned in left to right order ?
(A) Left most derivation
(C) Right most derivation
(D) Right most derivation traced out in reverse
(E) None of the above

42. CIDR (Classless Inter Domain Routing)—
(A) It is used in class C Networks
(B) It is used in class B Networks
(C) It is used in class A Networks
(D) All of the above
(E) None of the above

43. Internal auditors should review data system design before they are—
(A) Developed
(B) Implemented
(C) Modified
(D) All of the above
(E) None of the above

44. Which language has recently become the defector standard for interfacing application programs with relational database system ?
(A) Oracle (B) SQL
(C) Dbase (D) 4GL
(E) None of the above

45. A program that places programs into main memory and prepares them for execution—
(A) Linker
(B) Assembler
(C) Loader
(D) Absolute entity
(E) None of the above

46. A generalization of the Boyce Codd Normal Form to relation schemes which includes the multivated dependencies is called—
(A) Second Normal Form
(B) Third Normal Form
(C) Fourth Normal Form
(D) Fifth Normal Form
(E) None of

47. Lexical Analyzer transforms as input streams into—
(A) Regular Expression
(B) Sequence of tokens
(C) Binary
(D) Symbols
(E) None of the above

48. If we traverse binary search tree, in which manner that we get in ascending manner—
(A) Inorder
(B) Preorder
(C) Post order
(D) Graph
(E) None of the above

49. Binary number 101110000 is equivalent to decimal—
(A) 716 (B) 722
(C) 718 (D) 724

50. The collection of communication line and routers form the—
(A) Router
(B) Bridge
(C) Subnet
(D) Packet

PRACTICE QUESTIONARIE WITH ANSWERS

1. One megabyte equals approximately
1) 1,000 bits
2) 1,000 bytes
3) 1 million bytes
4) 1 million bits
5) 2,000 bytes

2. Data going into the computer is called?
1) Output
2) Algorithm
3) Input
4) Calculations
5) Flowchart

3. Which of the following refers to the memory in your computer?
1) RAM
2) DSL
3) USB
4) LAN
5) CPU

4. When you are working on a document on PC, where is the document temporarily stored?
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2) ROM
3) The CPU
4) Flash memory
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5. Information travels between components on the mother board through-
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3)Bays
4) Buses
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6. How are data organised in a spreadsheet?
1) Lines and spaces
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7. Which of the following is true?
1) Byte is a single digit in a binary number
2) Bit represents a grouping of digital numbers
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8. Transformation of input into output is performed by?

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3) Storage
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14. What menu is selected to cut, copy, and paste?
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2) Tools
3) Special
4) Edit
5) None

15. You can use the tab key to
1) Move a cursor across the screen
2) Indent a paragraph
3) Move the cursor down the screen
4) Only (1) and (2)
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5) None of these

ANSWERS:
1)3 2)3 3)1 4)1 5)4 6)3 7)3 8)5 9)3 10)2 11)2 12)4 13)2 14)4 15)2
16)3 17)1 18)1 19)2 20)1 21)2 22)4 23)2 24)4 25)4 26)3 27)4 28)1
29)2 30)3 31)2 32)3 33)1 34)2 35)2 36)3 37)2 38)5 39)1 40)2 41)4
42)4 43)4 44)5 45)4 46)2 47)1 48)4 49)4 50)1

1. What type of network connection is NOT a way of connecting to the Internet?
a. TCP/IP
b. Dial-up
c. ISDN
d. T1
e. T3

2. Which of the following is the correct syntax for a URL?

a. john@xyz.com
b. c:\windows
c. index.html
d. aol.com
e. All of the Above.

3. A “High Resolution” computer monitor will have:
a. High dpi, e.g. .31 dpi
b. Low dpi, e.g. .26 dpi
c. 256 colors
d. Resolution isn’t measured in dpi or colors
e. The same resolution as your printer.

4. Computer Memory is normally measured in:
a. Kilobytes
b. Megabytes
c. Gigabytes
d. Terabytes
e. None of the Above

5. In Microsoft Excel, which of the following formulas is incorrect?
a. =SUM(A1,B1,B2,C2)
b. =ROUND(SUM(A1:C2),2)
c. =ROUND(A1:C2,2)
d. =SUM(ROUND(A1:B1,B2:C2))
e. All of the Above

6. A world wide web contains web pages
a. residing in many computers
b. created using HTML
c. with links to other web pages
d. residing in many computers linked together using HTML

7. By an intranet we mean
a. a LAN of an organization
b. a Wide Area Network connecting all branches of an organization
c. a corporate computer network
d. a network connecting all computers of an organization and using the internet protocol

8. Internet uses
a. Packet switching
b. Circuit switching
c. Telephone switching
d. Telex switching

9. Internet is
a. a local computer network
b. a world wide network of computers
c. an interconnected network of computers
d. a world wide interconnected network of computers which use a common protocol to communicate with one another

10. _____ is a set of computer programs used on a computer to help perform tasks.
A. An instruction
B. Software
C. Memory
D. A processor

11. System software is the set of programs that enables your computer's hardware devices and _____ software to work together.
A. management
B. processing
C. utility
D. application

12. The PC (personal computer) and the Apple Macintosh are examples of two different:
A. platforms.
B. applications.
C. programs.
D. storage devices.

13. Apple Macintoshes (Macs) and PCs use different _____ to process data and different operating systems.
A. languages
B. methods
C. CPUs
D. storage devices

14. Servers are computers that provide resources to other computers connected to a:
A. network.
B. mainframe.
C. supercomputer.
D. client.

15. Smaller and less expensive PC-based servers are replacing _____ in many businesses.
A. supercomputers
B. clients
C. laptops
D. mainframes

16. DSL is an example of a(n) _____ connection.
A. network
B. wireless
C. slow
D. broadband

17. The difference between people with access to computers and the Internet and those without this access is known as the:
A. digital divide.
B. Internet divide.
C. Web divide.
D. broadband divide.

18._____ is the science revolving around the use of nanostructures to build devices on an extremely small scale.
A. Nanotechnology
B. Micro-technology
C. Computer forensics
D. Artificial intelligence

19. Word processing, spreadsheet, and photo-editing are examples of:
A. application software.
B. system software.
C. operating system software.
D. platform software.

20. Which of the following is NOT a necessary characteristic of computer fluency?
A. Understanding the capabilities and limitations of computers
B. Being able to write computer programs
C. Becoming comfortable with the use of computers
D. Understanding the legal, ethical, and societal implications of computing

21. According to the U.S. Department of Labor, approximately _____ % of American workers used computers on the job as of 2001.
A. 20
B. 40
C. 50
D. 70

22. Retail employees typically use _____ terminals to process sales transactions.
A. sales processing
B. transaction point
C. automatic teller
D. point of sale

23. The process of _____ involves automated study of consumer buying patterns in order to support marketing, inventory replenishment, and pricing decisions.
A. transaction processing
B. data mining
C. simulation
D. information processing

24. The engineering discipline that involves construction of molecularly-sized computing devices is called:
A. nanotechnology.
B. molecular processing.
C. silicon grafting.
D. nanoscience.

25. The prefix that stands for â•oebillionthâ•• is:
A. giga.
B. tera.
C. nano.
D. peta.

26. A small biomedical device currently on the market that can be implanted underneath the skin for identification purposes is called the:
A. Identitron.
B. Verichip.
C. Digicard.
D. Nanoguard.

27. The four main functions of a computer are:
A. input, processing, output, and storage.
B. learning, thinking, intelligence, and virtuosity.
C. data, information, bits, and bytes.
D. hardware, software, modeling, and operations.

28. The primary purpose of a computer is to process _____ and convert it into information.
A. electricity
B. data
C. raw material
D. a bit

29. Bit refers to a:
A. computer language.
B. CPU instruction.
C. 0 or 1 value.
D. digital representation of an alphabetic character.

30. There are _____ bits in a byte.
A. two
B. four
C. six
D. eight

31. In computer language, each letter, number, and an array of special characters consists of:
A. 8 kilobytes.
B. 8 bytes.
C. a bit.
D. 8 bits.

32. Which of the following is the correct sequence of smallest to largest unit of storage size?
A. megabyte ? terabyte ? gigabyte ? kilobyte ? petabyte
B. kilobyte ? megabyte ? gigabyte ? terabyte ? petabyte
C. kilobyte ? megabyte ? gigabyte ? petabyte ? terabyte
D. kilobyte ? megabyte ? petabyte ? terabyte ? gigabyte

33. The prefix kilo refers to approximately:
A. one thousand.
B. one million.
C. one hundred.
D. one billion.

34. Computers work in:
A. machine linguistics.
B. binary language.
C. HTML code.
D. bit language.

35. The metal or plastic case that houses the physical components of a computer together is called the:
A. central processing unit .
B. storage device.
C. motherboard.
D. system unit.

36. The brains of the computer which executes the instructions, is called the:
A. CPU.
B. RAM.
C. motherboard.
D. system unit.

37. Instructions and data that are about to be processed by the CPU are located in:
A. a CD-ROM.
B. RAM.
C. the hard disk.
D. the motherboard.

38. The circuitry that includes the CPU and memory chips is located on the:

A. system unit.
B. operating system.
C. motherboard.
D. computer platform.

39. All of the following are considered to be storage devices EXCEPT a:
A. floppy disk.
B. CPU.
C. CD.
D. hard disk drive.

40. What is the correct association between a hardware component and a computer function?
A. Monitor ? input
B. Mouse ? input
C. CPU ? storage
D. Hard disk ? processing

41. The main difference between application and system software is that:
A. application software is composed of program instructions but system software is not.
B. application software is stored in memory whereas system software is only in the CPU.
C. system software is unnecessary whereas application software must be present on the computer.
D. system software manages hardware whereas application software performs user tasks.

42. A document created in a word processing program or a budget created in a spreadsheet are both examples of documents created in:
A. application software.
B. system software.
C. an operating system.
D. a Windows platform.

43. Which of the following is an example of system software?
A. Word processor
B. Operating system
C. Management information system
D. Spreadsheet

44. The term that refers to computers that provide resources to other computers in a network is:
A. server.
B. mainframe.
C. platform.
D. resource provider.

45. If a large business is going to use a single computer to execute many programs for hundreds of users at the same time, performing relatively simple operations and transactions, the type of computer will probably be a
A. Supercomputer
B. PC
C. Mainframe
D. ISP

IBPS CWE COMPUTER KNOWLEDGE MODEL PAPER

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PRACTICE QUESTIONS SET 3

1.What is the ultimate purpose of Defragmentation ?
1) Make the PC faster
2) Create More Free Space
3) Delete temporary files
4) Reduce Power consumption
5) All of the above

2.Computers process data into information by working exclusively with :
1) multimedia
2) words
3) characters
4) numbers
5) None of these

3.You must install a (n) ..... on a network if you want to share a broadband Internet connection
1) router
2) modem
3) node
4) cable
5) None of these

4.The purpose of the primary key in a database is to :
1) unlock the database
2) provide a map of the data
3) uniquely identify a record
4) establish constraints on database operations
5) None of these

5.The design of the network is called the network
1) architecture
2) server
3) transmission
4) type
5) None of these

6.The most frequently used instructions of a computer program are likely to be fetched from:
1) the hard disk

2) cache memory
3) RAM
4) registers
5) None of these

7.Personal logs or journal entries posted on the Web are known as :
1) listservs
2) Webcasts
3) blogs
4) subject directories
5) None of these

8.Which of the following is NOT a type of broad band internet connection ?
1) Cable
2) DSL
3) Dial-up
4) Satellite
5) None of these

9.Linux is a(n) ..... operating system
1) open-source
2) Microsoft
3) Windows
4) Mac
5) None of these

10.Which of the following places the common data elements in order from smallest to largest
1) character, file, record, field, database
2) character, record, field, database, file
3) character, field, record, file, database
4) Bit, byte, character, record, field, file, database
5) None of these

11.The internet is .....
1) a large network of networkds
2) an internal communication system for a business
3) a communications system for the Indian government
4) All of these
5) None of these

12.Which of the following statements is FALSE concenring file names ?
1) Files may share the same name or the same extension but not both
2) Every file in the same foldr must have a unique, name
3) File extension is another name for file type
4) The file extension comes before the dot (.) followed by the file name
5) None of these

13.Which of the following would most likely NOT be a symptom of a virus ?
1) Existing program files and icons disappear
2) The CD-ROM stops functioning
3) THe Web browser opens to an unusual home page
4) Odd messages or images are displayed on the screen
5) None of these

14.What is a back up ?
1) Restoring the information backup

2) An exact copy of a system's information
3) The ability to get a system u and runnign in the event of a systemcrash or failure
4) All of these
5) None of these

15. ..... are lists of commands that appear on the screen
1) GUIs
2) Icons
3) Menus
4) Windows
5) None of these

16.What is the correct association between a hardware component
and a computer function?
1) Monitor > input
2) Mouse > input
3) CPU > storage
4) Hard disk > processing
5) None of these

17.What is the function of Drop Cap ?
1) It does not allow capital letters to be used in the documents
2) It makes first letter of each word capital letter in the documents
3) It lets you begin a paragraph witha large dropped initial capital letter
4) In automatically starts all paragraphs and sentences with capital letters
5) None of these

18.The errors that can be pointed out by the compiler are :
1) Syntax error
2) Symantic error
3) Logical error
4) Internal error
5) None of these

19. The move to the bottom of a document, press .....
1) Auto summarize
2) Home key
3) Ctrl + Home key
4) End key
5) Ctrl + End key

20.By default, your documents print in ..... mode
1) Landscape
2) Portrait
3) Page setup
4) Print preview
5) None of these

21.Select the odd one out :
1) Interpreter
2) Operating system
3) Compiler
4) Assembler
5) Programmer

22.For viewing video CDs, you would use .....

1) CD Player
2) Windows Media Player
3) WIndows Video Player
4) WIndows Movie Player
5) None of these

23. What's the name for the program or service that lets you view e-mail messages ?
1) Web browser
2) E-mail clients
3) E-mail ID
4) Internet
5) None of these

24. What does the SMTP in an SMTP server stand for ?
1) Simple Mail Transfer Protocol
2) Serve Message Text Process
3) Short Messaging Text Process
4) Short Messaging Transfer Protocol
5) None of these

25.What's considered the 'backbone' of the World Wide Web ?
1) Uniform resource locator (URL)
2) Hypertext mark-up language (HTML)
3) Hypertext transfer protocol (HTTP)
4) File transfer protocol (FTP)
5) None of these

26. We access the World Wide Web using :
1) Browsers
2) Instant messaging applications
3) High bandwidth
4) Search engine
5) None of these

27.The Internet began with the development of
1) USENET
2) ARPANET
3) Ethernet
4) Intranet
5) None of these

28.A wireless network uses ..... waves to transmit signals
1) mechanical
2) radio
3) sound
4) magnetic
5) None of these

29.What device includes an adapter that decodes data sent in radio signals ?
1) modem
2) digital translator
3) router
4) switch
5) None of these

30.Network components are connected to the same cable in the ..... topology
1) star
2) ring
3) bus
4) mesh
5) None of these

31.Small application programs that run on a Web page and may ensure a form is completed properly or provide animation are known as .....
1) flash
2) spiders
3) cookies
4) applets
5) None of these

32.Which of the following is Not a characteristic of a compluter ?
1) Intelligence
2) Speed
3) Versatility
4) Automation
5) None of these

33.The WWW standard allows programs on many different computer platforms to show the information on a server. Such programs are called :
1) ISP
2) Web Browsers
3) Web Servers
4) Web Modular
5) None of these

34. Outlook Express is a
1) E-mail client
2) Scheduler
3) Address book
4) All of the above
5) None of these

35.Which of the following is not a network ?
1) Local Area Network
2) Wide Area Network
3) Optical Fibre
4) All are networks
5) None of these

36.Which of the following is Not a characteristic of E-mail ?
1) Low cost
2) Record maintenance in database
3) High speed
4) Waste reduction
5) None of these

37. ..... is the science that attempts to produce machines that display the same type of intelligence that humans do
1) nanoscience
2) Nanotechnology
3) Simulation

4) Artificial intelligence
5) None of these

38.Who designed the first electronic computer - ENIAC ?
1) Van Neuman
2) Joseph M Jacquard
3) J presper Eckert and John W mauchly
4) Both 1 and 2
5) None of these

39..... is a collection of web - pages and ..... is the very first page that we see on opening of a website
1) Home page, Web page
2) Website, Home page
3) Web page, Home page
4) Web page, Website
5) None of these

40.When we run progra in HTML coding, ... is used as back-end and ..... works as front-end
1) Notepad, Internet Explorer
2) Notepad, MSN messenger
3) MS Word, Internet Explorer
4) Both 1 and 3
5) None of these

41.The server on the internet is also known as :
1) Repeater
2) Host
3) Gateway
4) AND Gate
5) None of these

42.Website is a collection of :
1) HTML documents
2) Graphic files
3) Audio and Video files
4) All of the above
5) None of these

43. ..... is a method in which multiple communicatioin devices are connected to one another efficiently
1) Switching
2) Redundancy
3) Capacity
4) Detecting
5) None of these

44. One computer that is nto considered a portable computer is .....
1) Mini computer
2) A Laptop
3) Micro computer
4) All of the above
5) None of these

45.The sharing of a medium and its path by 2 or more devices is called .....
1) Modulation
2) Encoding
3) Line discipline

4) Multiplexing
5) None of these

46.Device drivers are :
1) time power cords for external storage devices
2) experts who know to maximise the performance of device
3) small, special purpose programs
4) the innermost part of the operating system
5) None of these

47. Array is .....
1) linear data structure
2) non-linear data structure
3) complex data structure
4) simple data structure
5) None of these

48.A stored link to a webpage, in order to have a quick and easy access to it later, it called :
1) Bookmark
2) WP-link
3) Favourite
4) Both 1 and 3
5) None of these

49.Which input device cannot be used to work in MS Office ?
1) Sanner
2) Mouse
3) Keyboard
4) Joy stick
5) Lightpen

50..... is an animated character that gives help in MS Office ?
1) Office worker
2) Comic assistant
3) Office assistant
4) All of the above
5) None of these

ANSWERS:

1) 2 2) 4 3) 1 4) 2 5) 1 6) 2 7) 3 8) 3 9) 1 10) 3 11) 1 12) 4 13) 2 14) 4 15) 3 16) 2 17) 3 18) 1 19) 5 20) 2 21) 2 22) 2 23) 2 24) 1 25) 3 26) 1 27) 2 28) 2 29) 3 30) 1 31) 1 32) 1 33) 2 34) 4 35) 3 36) 2 37) 4 38) 1 39) 2 40) 1 41) 2 42) 4 43) 1 44) 1 45) 4 46) 3 47) 1 48) 4 49) 4 50) 3

PRACTICE QUESTIONS SET 4

1. Programs from the same developer, sold bundled together, that provide better integration and share common features, toolbars and menus are known as?
1) software suites
2) integrated software
3) software processing
4) personal information
5) none of these

2. A data warehouse is which of the following?
1) Can be updated by the users
2) Contains numerous conventions and formats

3) Organized around subject areas
4) Contains only current data
5) None of these

3. _____ servers store and manages files for network users.
1) Authentication
2) Main
3) Web
4) File
5) None of these
4. All of the following are examples of real security and privacy risks except?
1) hackers
2) spam
3) viruses
4) identify theft
5) None of these

5. Loading Operating System onto RAM is called?
1) Printing
2) Saving
3) Booting
4) Staring
5) None of these

6. In MICR, C stands for?
1) Code
2) Colour
3) Computer
4) Character
5) None of these

7. System software is the set of programs that enables your computer's hardware devices and ____ software to work together?
1) management
2) processing
3) utility
4) application
5) None of these

8. _____ are specially designed computer chips reside inside other devices, such as your car or your electronic thermostat?
1) Servers
2) Embedded computers
3) Robotic computers
4) Mainframes
5) None of these

9. The following are all computing devices, except?
1) notebook computers
2) cellular telephones
3) digital scanners
4) personal digital assistants
5) None of these

10. In a ring topology, the computer in possession of the _____ can transmit data?
1) packet

2) data
3) access method
4) token
5) None of these

11. This part of operating system manages the essential peripherals, such as the keyboard, screen, disk drives and parallel and serial ports _____
1) basic input/output
2) secondary system
3) peripheral system
4) marginal system
5) None of these

12. The bar at the top of a window that bears the name of thewindow is known as?
1) control panel
2) task bar
3) menu bar
4) status bar
5) title bar

13. _____ controls the way in which the computer system functions and provides a means by which users can interact with the computer.
1) The platform
2) Application software
3) Operating system
4) The motherboard
5) None of these

14. Servers are computers that provide resources to other computers connected to a?
1) mainframe
2) network
3) super computer
4) client
5) None of these

15. A device that operates under the control of another device is called?
1) Stem
2) Slave
3) Simulator
4) Emulator
5) None of these

16. URL stands for?
1) Universal Research List
2) Universal Resource List
3) Uniform Resource Locator
4) Uniform Research Locator
5) None of these

17. A database management system (DBMS) is a?
1) hardware system used to create, maintain and provide controlled access to a data- base
2) hardware system used to create, maintain, and provide uncontrolled access to a database.
3) software system used to create, maintain, and provide uncontrolled access to a database.
4)software system used to create, maintain and provide controlled access to a database.
5)None of these

18. The design of the network is called the network?
1) architecture
2) server
3) transmission
4) type
5) None of these

19.A Proxy server is used for which of the following?
1)To provide security against unauthorized users
2)To process client requests for web pages
3)To provide TCP/IP
4)To process client requests for database access
5) None of these

20.When data changes in multiple lists and all lists are not updated, this causes?
1) data redundancy
2) information overload
3) duplicate data
4) data inconsistency
5) None of these

21._____ are words that a programming language has set aside for its own use?
1) Control words
2) Reserved words
3) Control structures
4) Reserved keys
5) None of these

22.The most frequently used instru-ctions of a computer program are likely to be fetched from?
1) the hard disk
2) cache memory
3) RAM
4) registers
5) None of these

23.What is the shortcut key to "Undo" the last action in a document?
1) Ctrl + X
2) Ctrl + Y
3) Ctrl + Z
4) Ctrl + U
5) None of these

24.You must install a(n) _____ on a network if you want to share a broadband Internet connection.
1) router
2) modem
3) node
4) cable
5) None of these

25.The errors that can be pointed out by the compiler are?
1) Syntax errors
2) Semantic errors
3) Logic errors
4) System errors
5) None of these

26.Granting an outside organization access to internet web pages is often implemented using a(n)?
1) extranet
2) intranet
3) internet
4) hacker
5) None of these

27.Which term identifies a specific computer on the web and the main page of the entire site?
1) URL
2) Web site address
3) Hyperlink
4) Domain name
5) None of these

28.The code that relational database management systems use to perform their database task is referred to as?
1) QBE
2) SQL
3) OLAP
4) Sequel Server
5) None of these

29.Chip is a common nickname for a(n)?
1) transistor
2) resistor
3) integrated circuit
4) semiconductor
5) None of these

30.Programs such as Internet Explorer that serve as navigable windows into the Web are called
1) Hypertext
2) Networks
3) Internet
4) Web browsers
5) None of these

31.What menu is selected to cut, copy and paste?
1) File
2) Tools
3) Special
4) Edit
5) None of these

32.The most important or powerful computer in a typical network is?
1) desktop
2) network client
3) network server
4) network station
5) None of these

33.The primary purpose of software is to turn data into?
1) Web sites
2) information
3) programs
4) objects
5) None of these

34.The ability to find an individual item in a file immediately _____ is used?
1) file allocation table
2) directory
3) sequential access
4) direct access
5) None of these

35.To make a notebook act as a desktop model, the notebook can be connected to a _____ which is connected to a monitor and other devices?
1) bay
2) docking station
3) port
4) network
5) None of these

36.You can use the tab key to?
1) move cursor across the screen
2) indent a paragraph
3) move the cursor down the screen
4) Only (1) and (2)
5) None of these

37.A collection of related files is called a?
1) character
2) field
3) database
4) adjusting
5) None of these

38.Storage that retains its data after the power is turned off is referred to as?
1) volatile storage
2) non-volatile storage
3) sequential storage
4) direct storage
5) None of these

39.Which of the following is an example of connectivity?
1) Internet
2) floppy disk
3) power card
4) data
5) None of these

40._____ is the process of finding errors in software code?
1) Compiling
2) Testing
3) Running
4) Debugging
5) None of these

41.A _____ contains specific rules and words that express the logical steps of an algorithm?
1) syntax
2) programming structure

3) programming language
4) logic chart
5) None of these

42.Changing an existing document is called _____ the document?
1) creating
2) editing
3) modifying
4) adjusting
5) None of these

43.Virtual memory is?
1) memory on the hard disk that the CPU uses an extended RAM
2) in RAM
3) only necessary if you do not have any RAM in your computer
4) a back up device for floppy disks
5) None of these

44.Computers use the _____ number system to store data and perform calculations?
1) decimal
2) hexadecimal
3) octal
4) binary
5) None of these

45.The _____ key will launch the start buttons?
1) esc
2) shift
3) windows
4) shortcut
5) None of these

46.To move to the beginning of a line of text, press the _____ key?
1) home
2) a
3) page up
4) enter
5) None of these

47.When sending an e-mail, the _____ line describes the contents of the message?
1) to
2) subject
3) contents
4) CC
5) None of these

48.Which groupings do you work with when formatting text in Word?
1) Tables, paragraphs and indexes
2) Paragraphs, indexes and sections
3) Characters, sections and paragraphs
4) Indexes, characters and tables
5) None of these

49.Which of the following is the largest unit of storage?
1) GB
2) KB

3) MB
4) TB
5) None of these

50.The _____ tells the computer how to use its components?
1) utility
2) network
3) operating system
4) application program
5) None of these

ANSWERS:
1. (1) 2. (3) 3. (4) 4. (2) 5. (3) 6. (4) 7. (4) 8. (2) 9. (3) 10. (4) 11. (1) 12. (5) 13. (3) 14. (2) 15. (2) 16. (3) 17. (4) 18. (1) 19. (2) 20. (4) 21. (2) 22. (2) 23. (3) 24. (1) 25. (1) 26. (1) 27. (1) 28. (2) 29. (3) 30. (4) 31. (4) 32. (3) 33. (2) 34. (3) 35. (2) 36. (4) 37. (3) 38. (2) 39. (1) 40. (2) 41. (1) 42. (2) 43. (1) 44. (4) 45. (3) 46. (1) 47. (2) 48. (1) 49. (1) 50. (3)

PRACTICE QUESTIONS SET 5
1.A normal CD-ROM usually can store up to .....
1) 680 KB
2) 680 Bytes
3) 680 MB
4) 680 GB
5) None of these

2.Which programming languages are classified as low level languages ?
1) Basic, COBOL, FORTRAN
2) Prolog 2, Expert Systems
3) Knowledge based Systerms
4) Assembly Languages
5) None of these

3.Which of the following devices have a limitation that we can only
store information to it but cannot erase or modify it ?
1) Floppy Disk
2) Hard Disk
3) Tape Drive
4) CDROM
5) None of these

4.Which of the following is the largst manufacturer of Hard Disk Drives ?
1) IBM
2) Seagate
3) Microsoft
4) 3M
5) None of these

5. The programs which are as permanent as hardware and stored in ROM is known as
1) Hardware
2) Software
3) Firmware
4) ROM ware
5) None of these

6.To save a document in different location use :
1) Save

2) Save as
3) Save as web page
4) All of above
5) None of these

7.Which of the following is not an manufacturer of Hard Disk drives ?
1) Samsung
2) Interl
3) Seagate
4) Western Digital
5) None of these

8.The two basic types of record - access methods are
1) Sequential and random
2) Sequential and indexed
3) Direct and immediate
4) On-line and real time
5) None of these

9.A disadvantage of the laser printer is :
1) It is quieter than an impact printer
2) It is very slow
3) The output is of a lower quality
4) All of the above
5) None of these

10.Different components on the motherboard of a PC processor unit are linked together by sets or parallel electrical conducting lines. What are these lines called ?
1) Conductors
2) Buses
3) Connectors
4) Connectively
5) None of these
11.Which of the following professions has been affected by personal computers ?
1) Medical
2) Clerical and law
3) Accounting
4) All of the above
5) None of these
12. What is meant by a dedicated computer ?
1) Which is used by one person only
2) Which is assigned one and only one task
3) Which uses one kind of software
4) Which is meant for application software
5) None of these

13.A computer program that translates one program instructions at a time into machine language is called a / an
1) Interpreter
2) CPU
3) Compiler
4) Simulator
5) None of these

14.Instructions and memory address are represented by
1) Character code
2) Binary codes

3) Binary word
4) Partiy bit
5) None of these

15.As compared to diskettes, the hard disks are
1) More expensive
2) More portable
3) Less rigid
4) Slowly accessed
5) None of these

16.The secondary storage devices can only store data but they cannot perform
1) Arithmetic Operation
2) Logic operation
3) Fetch operstions
4) Either of the above
5) None of these

17.A physical connection between the microsprocessor memory and other parts of the microcomputer is known as
1) Path
2) Address bus
3) Router
4) All of the above
5) None of these

18. A group of magnetic tapes, videos or terminals usually under the control of one master is
1) Cyinder
2) Surface
3) Track
4) Cluster
5) None of these

19.Each model of a computer has a unique
1) Assembly of a computer
2) Machine language
3) High level language
4) All of the above
5) None of these

20.Which company is the biggest player in the microprocessor industry ?
1) Motorola
2) IBM
3) Intel
4) AMD
5) None of these

21.Which computer memory is used for storing programs and data currently being processed by the CPU ?
1) Mass memory
2) Internal memory
3) Non-volatile memory
4) PROM
5) None of these

22.Microprocessors can be used t make
1) Computer
2) Digital systems

3) Calculators
4) All of the above
5) None of these

23.The subject of cybernetics deals with the science of
1) Genetics
2) Control and communications
3) Molecular biology
4) Biochemistry
5) None of these

24.A term associated with the comparison of processing speeds of different computer system is :
1) EFTS
2) MPG
3) MIPS
4) CFPS
5) None of these

25.An integrated circuit is
1) A complicated circuit
2) An integrating device
3) Much costlier than a single transistor
4) Fabricated on a tiny silicon chip
5) None of these

26.Which command is used to set a name to a disk in DOS ?
1) VOLUME
2) VOL
3) LABEL
4) DISKLABEL
5) None of these

27.Which file starts MS Word ?
1) Winword.exe
2) Word.exe
3) Msword.exe
4) Word2003.exe
5) None of these

28.To get to the 'Symbol' dialog box, click on the ..... menu and choose 'Symbol'.
1) Insert
2) Format
3) Tools
4) Table
5) None of these

29.Superscript, subscript, outline, emboss, engrave are known as
1) font styles
2) font effects
3) word art
4) text effects
5) None of these

30.Shimmer, Sparkle text, Blinkng Background etc. are known as
1) font styles
2) font effects

3) word art
4) text effects
5) None of these

31.Which of the following is not availabel in Font Spacing ?
1) Normal
2) Loosely
3) Condensed
4) Expanded
5) None of these

32.Bold, Itali, Regular are known as
1) font styles
2) font effects
3) word art
4) text effects
5) None of these

33.If you begin typing an entry into acell and then realize that you don't want your entry placed into a cell, you :
1) Press the Erase key
2) Press esc
3) Press the Enter button
4) Press the Edit Formula button
5) None of these

34.Which of the following will not cut information?
1) Pressing Ctrl + C
2) Selecting Edit > Cut. from the menu
3) Clicking the cut button ont he standard
4) Pressing Ctrl + X
5) None of these

35.Computer connected to a LAN (Local Area Network) can
1) run faster
2) go on line
3) share information and / or share peripheral equipment
4) E-mail
5) None of these

36.A self replicating program, similar to a virus which was taken from a 1970s science fiction novel by John Bruner entitled the Shockwave Rider is .....
1) Bug
2) Vice
3) Lice
4) Worm
5) None of these

37.Unwanted repetitious messages, such as unsolicited bulk - e-mail is known as
1) Spam
2) Trash
3) Calibri
4) Courier
5) None of these

38.COBOL is widely used in ..... applications
1) Commericial

2) Scientific
3) Space
4) mathematical
5) None of these

39.VDU is also called
1) Screen
2) Monitor
3) Both 1 & 2
4) printer
5) None of these

40.What kind of software would you most likely use to keep track of billing account ?
1) Word Processing
2) Electronic Publishing
3) Spreadsheet
4) Web authoring
5) None of these

41.Test the validity of the statements ?
1) 1 KB = 1024 BYTES
2) 1 MB = 2048 BYTES
3) 1MB = 100 KILOBYTES
4) 1 KB = 1000 BYTES
5) None of these

42.Which of the following is not a computer language ?
1) BASIC
2) C++
3) C#
4) Java
5) Microsoft

43.Which among the following is a correct definition of "Digital Divide"?
1) gap between people having access to mobile and internet access
2) gap between people having access to internet / IT and no internet / IT
3) gap between people having access to broadband and narrowband internet
4) gap between people having access to internet banking and normal banking
5) gap between the people having an email account and no email Account

44.Now a days Vishing has become a criminal practice of using social engineering over which of the following ?
1) Social networking sites
2) Mobile Phones
3) E-mail
4) Cyber cafes
5) All of the above

45.What is the fullform of W3C?
1) World Wide Web Consortium
2) World Wide Web Company
3) World Wide Web Center
4) World Wide Web Command
5) None of these

46.Which among the following is used for removing a software bug / defect which is available for free of cost from the software provider ?

1) Version
2) Update
3) Help
4) Patch
5) Syntax

47.In the MICR Code Line Structure what do represent the first three digits of Sort field number consisting of nine digits ?
1) City
2) Bank
3) Branch
4) Account Type
5) None of the above

48.Most of the internet banking sites provide which of the following feature to reduce the risk of keystroke logging for the password entry ?
1) Virtual keyboard
2) Finger Touching
3) Touchscreen
4) Shape Writer
5) Dasher

49.ADSL data communications technology uses which of the following for faster data transmission ?
1) Voiceband modem
2) Wireless Modem
3) Copper telephone Lines
4) Sockets
5) None of the above

50.What is the purpose of keeping electronic devices such as computers, televisions, and remote controlled devices on Sleep mode ?
1) Reduce Power consumption
2) Back UP
3) To write contents of RAM to hard disc
4) To improve download speed
5) None of thea above

ANSWERS:
1) 3 2) 4 3) 4 4) 2 5) 3 6) 2 7) 2 8) 1 9) 5 10) 2 11) 4 12) 2 13) 1 14) 2 15) 1 16) 4 17) 2 18) 4 19) 2 20) 3 21) 2 22) 4 23) 2 24) 4 25) 4 26) 3 27) 1 28) 1 29) 2 30) 4 31) 2 32) 1 33) 2 34) 1 35) 3 36) 4 37) 1 38) 1 39) 3 40) 3
41) 1 42) 5 43) 2 44) 2 45) 1 46) 4 47) 1 48) 1 49) 3 50) 1

PRACTICE QUESTIONS SET 6
1.Which command devides the surface of the blank disk into sectors and assign a unique address to each one
1) Ver
2) Format
3) Fat
4) Chkdsk
5) None of these

2.If you need to duplicate the entire disk, which command will you use ?
1) Copy
2) Diskcopy
3) Chkdsk
4) Format
5) None of these

3.A ..... sometimes called a boot sector virus, executes when a computer boots up because it resides in the boot sector of a floppy disk or the master boot record of a hard disk
1) system virus
2) Trojan horse virus
3) file virus
4) macro virus
5) None of these

4.A result of a computer virus can not lead to .....
1) Disk Crash
2) Mother Board Crash
3) Corruption o f program
4) Deletion of files
5) None of these

5.Every computer connected to an intranet or extranet must have a distinct .....
1) firewall
2) proxy server
3) IP address
4) domain name
5) None of these

6.Programming language built into user programs such as Word and Excel are known as .....
1) 4GLs
2) Macro languages
3) object-oriented languages
4) visual programming languages
5) None of these

7.Firewalls are used to protect against .....
1) unauthorized Attacks
2) virus Attacks
3) Data Driven Attacks
4) Fire Attacks
5) None of these

8.Which of the following extensions suggest that the file is a backup copy
1) Bak
2) Bas
3) Com
4) Txt
5) None of these

9.Computer programs are written in a high - level programming language; however, the human readable version of a program is called .....
1) cache
2) instruction set
3) source code
4) word size
5) None of these

10.The software tools that enable a user to interact with a computer
for specific purposes are known as .....
1) Hardware
2) Networked Software

3) Shareware
4) Applications
5) None of these

11..... proessing is used when a large mail-order company accumulates orders and processes them together in one large set
1) Batch
2) Online
3) Real-time
4) Group
5) None of these

12.When a file contains instructions that can be carried out by the computer, it is often called a(n) ..... file
1) data
2) information
3) executable
4) application
5) None of these

13.A complier translates a program written in a high - level language into .....
1) Machine language
2) An algorithm
3) A debugged program
4) Java
5) None of these

14.A set of step - by - step procedures for accomplishing a task is known as a(n) .....
1) algorithm
2) hardware program
3) software bug
4) firmware program
5) None of these

15.A complete electronic circuit with transistors and other electronic components on a small silicon chip is called a(n) .....
1) Workstation
2) CPU
3) Magnetic disk
4) Integrated circuit
5) None of these

16.A saved document is referred to as a .....
1) file
2) word
3) folder
4) project
5) None of these

17.What is output ?
1) What the processor takes from the user
2) What the user gives to the processor
3) What the processor gets from the user
4) What the processor gives to the user
5) None of these

18.When you turn on the computer, the boot routine will perform this test .....
1) RAM test

2) Disk drive test
3) Memory test
4) Power - on self-test
5) None of these

19.Which of the following storage media provides sequential access only ?
1) Floppy disk
2) Magnetic disk
3) Magnetic tape
4) Optical disk
5) None of these

20.In word processing, an efficient way to move the 3rd paragraph to place it after the 5th paragraph is .....
1) copy and paste
2) copy, cut and paste
3) cut, copy and paste
4) cut and paste
5) None of these

21. Hardware includes .....
1) all devices used to input data into a computer
2) sets of instructions that a computer runs or executes
3) the computer and all the devices connected to it that are used to input and output data
4) all devices involved in processing information including the central processing unit, memory and storage
5) None of these

22.The quickest and easiest way in Word, to locate a particular word or phrase in a document is to use the ..... command
1) Replace
2) Find
3) Lookup
4) Search
5) None of these

23.The term 'user interface' refers to .....
1) What the user sees on the screen and how they can interact with it
2) How the operating system responds to user commands
3) the means by which the user interacts with the peripheral devices on the computer
4) the monitor that is available for the computer
5) None of these

24.For creating a document, you use ..... command at File Menu.
1) Open
2) Close
3) New
4) Save
5) None of these

25.The ..... becomes different shapes depending on the task
you are performing
1) Active tab
2) Insertion point
3) Mouse pointer
4) Ribbon
5) None of these

26.Specilizd programs that asist users in locating information on the Web are called ....

1) Information engines
2) Search engines
3) Web browsers
4) Resource locators
5) None of these

27.The background of any Word document .....
1) Is always white colour
2) Is the colour you presect under the Options menu
3) Is always the same for the entire document
4) Can have any colour you choose
5) None of these

28.Correcting errors in a program is referred to as .....
1) debugging
2) bugging
3) rectifying
4) modifying
5) None of these

29.Any letter, number, or symbol found on the keyboard that you can type into the computer .....
1) output
2) character
3) type
4) print
5) font

30.A symbol or question on the screen that prompts you to take
action and tell the computer what to do next .....
1) scanner
2) questionnaire
3) prompt and dialog box
4) information seeker
5) None of these

31.Commands at the top of a screen such as : FILE-EDIT-FONT-TOOLS to operate and change things within programs .....
1) menu bar
2) tool bar
3) user friendly
4) word processor
5) None of these

32.The primary device that a computer uses to store information.....
1) monitor
2) memory
3) disk
4) hard drive
5) None of these

33.A file extension is separated from the main file name with a(n) ....., but no spaces
1) questiion nark
2) exclamation mark
3) underscore
4) period
5) None of these

34.Application software is designed to accomplish .....
1) real -w orld tasks
2) computer-centric tasks
3) gaming tasks
4) operating system tasks
5) None of these

35.A ..... is a device that not only provdes surge protection, but also furnishes your computer with battery backup power during a power outage
1) surge strip
2) USB
3) UPS
4) battery strip
5) None of these

36.The term ..... designates equipment that might be added to a computer system to enhance, its functionality
1) digitial device
2) system add-on
3) disk pack
4) peripheral device
5) None of these

37..... this is the act of copying or downloading a program from a network and making multiple copies of it.
1) Network piracy
2) Plagiarism
3) Software piracy
4) Site-license piracy
5) None of these

38.When installing ....., the user must copy and usually decompress program files from a CDROM or other medium to the hard disk
1) programming software
2) system hardware
3) applications hardware
4) applications software
5) None of these

39.Which one of the following would be considered as a way that a computer virus can enter a computer system ?
1) Opening an application previously installed on the computer
2) Borrowed an illegal copy of software
3) Viewing a website without causing any additional transctions
4) Running antivirus programs
5) None of these

40.Programs such as Mozila Firefox that serve as navigable windows into the Web are called .....
1) Hypertext
2) Networks
3) Internet
4) Web browsers
5) None of these

41.What is the main difference between a mainframe and a super computer ?
1) Super computer is much larger than mainframe computers
2) Super computers are much smaller than mainframe computers

3) Supercomputers are focused to execute few programs as fast as possible while mainframe uses its power to execute as many programs concurrently
4) Supercomputers are focused to execute as many programs as possible while mainframe uses its power to execute few programs as fast as possible
5) None of these

42.What is the function of Recycle Bin ?
1) Store deleted file
2) Store temporary file
3) Store corrupted file
4) Store Document file
5) None of these

43.Which is the latest version of MS Office ?
1) Office XP
2) Windows XP
3) Office 2007
4) Office 2010
5) None of these

44.Which device can not be shared in network ?
1) Floppy
2) Keyword
3) Computer
4) Printer
5) None of these

45.What is the purpose of query ?
1) Input data
2) Output data
3) Sort & filter
4) All of above
5) None of these

46.Which port doesn't exist in computer ?
1) USB
2) Parallel
3) Com1 / Com2
4) RAW
5) None of these

47.What is the name of exel files ?
1) Workbook
2) Worksheet
3) Spreadsheet
4) Spread book
5) None of these

48.Workgroup means
1) Computers in network
2) Individual user
3) Individual computer
4) All of he above
5) None of these

49.Synonym can be reviewed with

1) Spelling and grammar
2) Thesaurus
3) Both
4) Synonym viewer
5) None of these

50.Which command allows you to reduce fragments of file and optimize the performance of disk ?
1) Scandisk
2) Diskcomp
3) Chkdsak
4) Defrag
5) None of these

ANSWERS:
1) 2 2) 2 3) 5 4) 2 5) 2 6) 4 7) 1 8) 1 9) 3 10) 4 11) 1 12) 3 13) 1 14) 1 15) 4 16) 1 17) 4 18) 2 19) 2 20) 4 21) 4 22) 2 23) 1 24) 3 25) 3 26) 2 27) 4 28) 1 29)2 30) 3 31) 1 32) 4 33) 5 34) 4 35) 3 36) 4 37) 3 38) 1 39) 2 40) 4 41) 3 42) 1 43) 4 44) 2 45) 4 46) 4 47) 1 48) 1 49) 2 50) 4

PRACTICE QUESTIONS SET 7
1. A framwork in which circuit boards can be mounted is...
(A) Switch circuit
(B) Chip
(C) Card cage
(D) Bar code
(E) None of these
Answer: (C)

2. A convolutional code that is prone to catastrophic error propagation is...
(A) Mnemonics
(B) Gray code
(C) machine code
(D) Catastrophic code
(E) None of these
Answer: (D)

3. Which one of the following input device is user-programmable?
(A) Dumb terminal
(B) Smart terminal
(C) VDT
(D) Intelligent terminal
(E) None of these
Answer: (D)

4. The barcode which is used on all types of items, is read by a scanning device directly into the computer. What is the name of this scanning device?
(A) Laser scanner
(B) Wand
(C) OCR
(D) MICR
(E) None of these
Answer: (A)

5. A Plastic card similar to a credit card but having some memory and a microprocessor embedded within it is (A) Punched paper tape

(B) Chip card
(C) Card punch
(D) Magnetic tape
(E) None of these
Answer: (B)

6. The category of operating system that you most likely have running on your PDA computer is a _____ operating system.
(A) real-time
(B) single-user, single-task
(C) single-user, multi-task
(D) multi-user, multi-task
(E) None of these
Answer: (B

7. Which of the following is an example of a real-time operating system?
(A) Lynx
(B) MS DOS
(C) Windows XP
(D) Symbian
(E) None of these
Answer: (A)

8. A real-time operating system is most likely to be used for which of the following tasks?
(A) Controlling access to a shared printer in a network
(B) Ensuring that the system clock works correctly on a server
(C) Managing the access to system files in a laptop computer
(D) Controlling the fuel injection system of an automobile engine
(E) None of these
Answer: (D)

9. An essential difference between the operating system that runs a typical desktop computer and the operating system that runs a typical PDA is that
(A) the desktop OS has a graphical user interface whereas the PDA OS does not
(B) the desktop OS can run several programs simultaneously whereas the PDA OS cannot
(C) the desktop OS manages hardware resources whereas the PDA OS does not
(D) the desktop computer has an OS whereas a PDA does not
(E) None of these
Answer: (B)

10.To set a register or counter to the all-zero-state is...
(A) Rerun
(B) Reset
(C) Remote
(D) Release
(E) None of these
Answer: (B)

11.A set of information that defines the status of resources allocated to a process is...
(A) Process control
(B) ALU
(C) Register Unit
(D) Process description
(E) None of these
Answer: (D)

12. A family of polynomial block codes designed to correct burst errors is known as
(A) Bar codes
(A) Gray codes
(C) Fire codes
(D) mnemonics codes
(E) None of these
Answer: (C)

13. The MS-DOS operating system is a
(A) graphical user interface, single-tasking operating system
(B) graphical user interface, multi-tasking operating system
(C) command-driven interface, single-tasking operating system
(D) command-driven interface, multi-tasking operating system
(E) None of these
Answer: (C)

14. Which of the following was an early desktop operating system that included an integrated graphic user interface with point-and-click features?
(A) MS-DOS
(B) Mac OS
(C) Unix
(D) Gnome
(E) None of these
Answer: (B)

15.CD-ROM can store upto ____ MB of data
(A) 600 MB
(B) 400 Floppy disk
(C) 320 MB
(D) Both (A) and (B)
(E) None of these
Answer: (D)

16. The most recent version of the Mac OS is based on the _____ operating system
(A) Windows
(B) Linux
(C) Unix
(D) CMOS
(E) None of these
Answer: (C)

17. The _____ operating system was initially created in the early 1970s at AT&T's Bell Labs.
(A) Linux
(B) DOS
(C) Unix
(D) GNU
(E) None of these
Answer: (C)

18. The essential difference between an operating system like Linux and one like Windows is that
(A) Windows can run with an Intel processor, whereas Linux cannot
(B) Linux is proprietary, whereas Windows is not
(C) any programmer can modify Linux code, which is not permitted with Windows
(D) there are multiple versions of Linux, but only one version of Windows
(E) None of these

Answer: (C)

19. Which of the following is NOT an advantage of open-source operating systems over proprietary versions?
(A) Free use and distribution
(B) Availability of technical support
(C) Availability of source code
(D) Ability to modify code
(E) None of these
Answer: (B)

20. Use of icons and windows are characteristic of a _____ interface
(A) command-driven
(B) windows-oriented
(C) graphical-user
(D) menu-driven
(E) None of these
Answer: (C)

22. The invention of the slide rule is attributed to ...
(A) Babbage
(B) Oughtred
(C) Pascal
(D) Napier
(E) None of these
Answer: (B)

23. The main purpose of the offline device is...
(A) To reduce the no.of operator errors in recording data
(B) To save computer time
(C) To save floor space in the cimputer centre
(D) All of the above
(E) None of these
Answer: (B)

24. The ability of an operating system to control the activities of multiple programs at the same time is called
(A) multitasking
(B) multi-processing
(C) multi-operating
(D) multi-paging
(E) None of these
Answer: (A)

25.A computer assisted method for the recording and analysing of existing hypothetical systems is known as
(A) Distributed processing
(B) Data transmission
(C) Data link
(D) Data flow
(E) None of these
Answer: (D)

IBPS COMPUTER KNOWLEDGE MCQs

1. In a network, the computer that stores the files and process the data is named as
a) Server
b) Terminal
c) Modem

d) All of the above

2. Viruses are called that because
a) They are viruses
b) They can copy themselves and spread
c) Both (a) and (b)
d) None of the above

3. Which of the can't spread virus
a) An e-mail with attachment
b) A plain text mail
c) Downloading files over the web
d) None of the above

4. There is a new anti-virus software update available, when it is downloaded to your computer
a) Everyday
b) Only in the night
c) When you next switch on your computer
d) All of the above

5. Numbers are stored and transmitted inside a computer in
a) Binary form
b) ASCII code form
c) Alphabets form
d) Numerical form

6. CPU capacity can be measured in
a) BPS
b) MIPS
c) MHz
d) MPI

7. MPIS stands for
a) Million Instructions Per Second
b) Million Instructions Per Season
c) Monthly Instructions Per Second
d) Million Inputs Per Second

8. LAN speeds are measured in
a) BPS
b) KBPS
c) MBPS
d) MIPS

9. Modem speeds are measured in
a) BPS
b) KBPS
c) MBPS
d) MIPS

10. BPS stands for
a) Bits Per Second
b) Bits Per Season
c) Bytes Per Second
d) Bits Per System

11. In processing cheques which of the following I/O techniques have banks traditionally followed?
a) OCR
b) MICR
c) Barcode
d) VRT

12. What is object of UPS?
a) Using for storage
b) To increase the speed of a computer
c) Provides backup power
d) All of the above

13. QWERTY is used with reference to
a) Monitor
b) Printer
c) Keyboard
d) Mouse

14. "Zipping" a file means
a) Encrypting the message
b) Compressing the message
c) Transfer the message
d) All of the above

15. Integrated Circuits (IC) chips used in computers are made with
a) Gold
b) Silver
c) Silicon
d) Coper

16. What is the Super Computer developed in India
a) CRAY
b) PARAM
c) Both (a) and (b)
d) None of the above

17. Which of the following is different from other
a) Internet
b) Windows
c) Unix
d) Linux

18. What is the full form of WWW?
a) World Wide Web
b) World With Web
c) Work Wide Web
d) World Wide Wet

19. Which of the following Command is required to reboot the computer
a) CTRL+ALT+DEL
b) CTRL+ALT+TAB
c) CTRL+ALT+SHIFT
d) CTRL+SHIFT+DEL

20. Select the ODD one
a) Operating system

b) Interpreter
c) Compiler
d) Assembler

21. PC stands for
a) Practical Computer
b) Personal Computer
c) Private Computer
d) Personal Contact

22. The computer code for interchange of information between terminals is
a) BCDIC
b) BCD
c) ASCII
d) None of the above

23. The retrieval of information from the computer is defined as
a) Data processing
b) Input
c) Output
d) All of the above

24. Which one of the following is NOT a computer language?
a) MS-Excel
b) BASIC
c) COBOL
d) C++

25. "C" is
a) A letter
b) A word
c) A language
d) An alphabet

26. Difference Engine invented by
a) Charles Babbage
b) John McCarthy
c) Pascal
d) Newton

27. First generation computer systems used
a) Transistors
b) Vacuum Tubes
c) Both (a) and (b)
d) None of the above

28. A byte is made up of
a) Eight bytes
b) Eight binary digits
c) Two binary digits
d) Two decimal points

29. Doing research by using an on-line database instead of a printed set of similar information offers which of the following advantage
a) More current information
b) Easier to understand

c) Better charts
d) None of the above

30. Software programs that allow you to legally copy files and give them away at no cost are called which of the following
a) Time sharing
b) Public domain
c) Shareware
d) None of the above

31. The term that we use to describe physical components of the system
a) Hardware
b) Input
c) Software
d) None of the above

32. Which of the following is used to indicate the location on the computer monitor
a) Mouse
b) Cursor
c) Both (a) and (b)
d) None of the above

33. Mr. Saketh needs to design invitation card. What type of computer program is suitable?
a) MS-Word
b) Desktop Publishing
c) Simulation
d) None of the above

34. Which combination of keys needs to be pressed to make a percent sign?
a) Shift+2
b) Shift+3
c) Shift+4
d) Shift+5

35. What process should be used to recall a document saved previously?
a) Copy
b) Save
c) Retrieve
d) Enter

36. What term applies to a collection of related records in a
database?
a) Field
b) File
c) Both (a) and (b)
d) None of the above

37. How are data organized in a spreadsheet?
a) Rows and Columns
b) Boxes
c) Tables
d) None of the above

38. Which of the following mode we use to deliver e-mail
a) Postal
b) Courier
c) Computer

d) Fax

39. VIRUS stands for
a) Vital Information Recourse Under Siege
b) Vital Information Reason Under Siege
c) Vital Information Recourse Under System
d) Virus Information Recourse Under Siege

40. ------ Is known as unauthorized access into others system
a) Hacking
b) Encryption
c) Decryption
d) None of the above

ANSWERS:
11. b 12. c 13. c 14. b 15. c 16. b 17. a 18. a 19. A 20. a 21. b 22. c 23. c 24. a 25. c 26. a 27. b 28. B 29. a 30. b 31. a 32. b 33. b 34. d 35. c 36. b 37.a 38. c 39. a 40. a

WISH YOU ALL THE BEST FOR UPCOMING EXAMS

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