

BCS-011

PC SOFTWARE

Question 1: (Covers Block 1)

a) What is the role of following components of a Computer System:

(i) Control Unit : Control Unit, acts like the supervisor seeing that things are done in proper fashion. The control unit determines the sequence in which computer programs and instructions are executed. Things like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them. It also acts as a switch board operator when several users access the computer simultaneously. Thereby it coordinates the activities of computer's peripheral equipment as they perform the input and output. Therefore, it is the manager of all operations mentioned in the previous section.

(ii) Arithmetic Logic Unit : The Arithmetic Logical Unit is an important component of the CPU, which carry the actual execution of the instructions. After entering the data through the input device it is stored in the primary storage unit. Then processing of the data and instruction are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. Data is transferred to ALU from storage unit when required. After processing, the output is returned to the storage unit for further processing or getting stored.

(iii) Ports and Connectors : A port is a connector located on the motherboard or on a separate adapter. Ports and Connectors allow the computer to communicate with different devices and peripherals attached with it.

(iv) Motherboard : The motherboard is the main circuit board of a microcomputer. It is also known as the main board or system board. It is the circuit board in which all the components are connected through cable within a personal computer. Many devices are connected with motherboard directly or indirectly. Motherboards usually provide the interface between the CPU memory and input/output peripheral circuits, main memory, and facilities for initial setup of the computer immediately after power-on.

b) What is an instruction in the context of a Microprocessor? How does a microprocessor instruction specify data and operations? Explain with the help of an example.

In personal computers, the CPU is also referred by the term Microprocessor. Every CPU is capable of performing certain instructions (known as machine instruction). An instruction refers to an operation that can be performed by the processor directly. The entire set of instructions that can be executed by the processor directly, through the logic in hardware, form the instruction set of the processor. An

instruction tells the processor what task is to be performed and what micro-operations need to be completed to perform the task.

Every instruction is comprised of two parts: **opcode** and **operands**. The opcode specifies the operation to be performed and the operands provide the data on which the operation is to be performed. To understand the concept of instruction more clearly let us assume a simple hypothetical computer which the capability to perform eight different operations. Every operation is specified by a unique opcode as given in Table

Operation	Opcode
Addition	000
Subtraction	001
Multiplication	010
Division	011
Modulus	100
Complement	101
Bitwise AND	110
Bitwise OR	111

Let us further assume that our computer can process only two-digit decimal numbers, i.e. there can be a maximum of two operands each of a maximum of two digits. Thus the computer can add or subtract numbers containing a maximum of two digits. A simple instruction can thus be written as a combination of an opcode and its associated operands. Opcode is denoted by its unique binary code. The operands are decimal digits and therefore also need to be converted to binary code system to pass them as operands to the processor. Suppose BCD code is used to represent the operands. Then following are examples of some valid instructions on the processor:

Instruction	Effect
0001001001100100101	93 + 25
10110000101	Complement 85
0110010010100000101	25 / 05

In the first instruction, the first three bits represent the opcode and the remaining sixteen bits represent the two operands each a two digit decimal number expressed using BCD code. The opcode for addition as described in the table is 000 and the BCD codes for 9,3,2 and 5 are 1001, 0011, 0010 and 0101 respectively. Thus the instruction 0001001001100100101 represents 93 + 25. Similarly, in the second instruction, first three bits represent the opcode and the remaining eight bits specify the operand to perform the operation. However, this is the case of a very simple hypothetical computer. Real world processors are much more complex and capable of performing more than 500 machine

instructions. Further they can take their operands in a number ways: directly, from registers, from memory etc. Moreover, modern processors can perform calculations on large numbers. Thus an instruction in a modern CPU could easily comprise more than 50 bits.

- C) A computer system was designed to have a good latest processor and I/O devices, however the designer of the computer did not put any RAM in it. The computer does have a hard disk of 1 tera-byte. Will this computer be able to execute programs? Explain giving justification in support of your answer.

A computer system was designed to have a good latest processor and I/O devices, however the designer of the computer did not put any RAM in it. The computer does have a hard disk of 1 tera-byte. This computer can not able to execute programs because **Random Access Memory** (RAM) is really the main store and is the place where the program and software we load gets stored. When the CPU runs a program, it fetches the program instructions from the RAM and carries them out. Similarly, if the CPU needs to store the final results of calculations, it stores them in RAM. Thus, the CPU can both READ data from RAM and WRITE data into the RAM.

f) Compare and contrast the following technologies

(i) SRAM and DRAM

<u>SRAM</u>	<u>DRAM</u>
SRAM is an on-chip memory whose access time is small	DRAM is an off-chip memory which has a large access time
SRAM is of smaller size.	DRAM is available in larger storage capacity
SRAM is expensive	DRAM is cheap .
The cache memory is an application of SRAM	DRAM is used in main memory .
SRAM is complex due to the usage of a large number of transistors.	DRAM is simple to design and implement.
In SRAM a single block of memory requires six transistors	DRAM needs just one transistor for a single block of memory.
Power consumption is lower in SRAM than DRAM.	Power consumption is higher in DRAM than SRAM.

(ii) USB and Serial Port

USB Ports	Serial Ports
USB port has the rate of data transfer 12Mbps for disk drives and 1.5Mbps for the devices that needs less bandwidth.	Serial port is capable of transmitting only 1 bit at a time with rate of data transfer of about 57kbps.
In many computers, additional USB port is found on the front along with two standard USB ports at the back.	Serial port is found at the back of the computer and it is a part of motherboard.
USB port transmit data very fast. So, it is now commonly used by the people.	Serial port transmit data at a very slow rate. So, serial ports are now rarely used.
USB devices can be used across multiple platforms. It works on Windows, Mac and can be used with other operating systems too.	Serial Ports are a part of the motherboards and its functionality is depend on its OS drivers but it is not so easy to operate as USB Port
There is no need to turn off the computer for installing the devices. You can simply plug in and do your work.	In case of Serial port, it causes problems in installing the devices if computer is not turned off.
USB ports are user-friendly. Now OTP is supporting Android with USB pen drive.	Serial ports are not user-friendly as compare to USB Ports .

(iii) Joystick and Mouse

Mouse

Mouse is most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU when the mouse buttons are pressed.

Generally it has two buttons called left and right button and a wheel is present between the buttons. Mouse can be used to control the position of cursor on screen, but it cannot be used to enter text into the computer.

Advantages

- Easy to use
- Not very expensive
- Moves the cursor faster than the arrow keys of keyboard.

Joystick

Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing(CAD) and playing computer games.

(iv) Projection displays and LED display

Light Emitting Diodes Monitors (LED)

Light Emitting Diodes (LED) is the latest technology which is being used now a days for making high definition TV screens and monitors. It is a semi-conductor light source. In this technology diodes are used to light up the screen instead of liquid crystal Diodes. LED is known as light emitting diode. It is an electronic device that lights up when electricity is passed through it. LEDs are usually red. They are good for displaying images because they can be relatively small, and they do not burn out. However, they require more power than LCD monitors. LED is light weight monitors and is used in laptop computers and in TV. The Life of LED monitors is three times than that of LCD monitors and they have less warm up time than that of CRT or LCD monitors. These monitors require less space on the desk, less power consumption and have flicker free screen.

Projection Displays

These are normally used for large group presentations. These systems can be connected to a computer and whatever appears on the computer terminal gets enlarged and projected on a large screen. Video projector receives video signals and projects the corresponding image on a projection screen. It uses a lens system for this projection. These are popularly used for seminars, class room lectures, marketing presentations and conference room presentations etc.

g) Explain the characteristics/functions of the following I/O devices:

(i) Inkjet printer:

The Inkjet printer works on inkjet technology and produces better quality printouts than dot matrix printers. These print by spraying a controlled stream of tiny ink droplets accurately on the paper forming either dot matrix or solid characters. The printing quality of these printers is very good with a speed of 700 or more characters per second. These are non-impact and hence are relatively silent during the printing process. These printers are easy to use and can be used to print color pages.

Advantages

Compared to other printers, inkjet printers have a number of advantages. These are

- They are quieter in operation than impact printers.
- They can print finer, smoother details through higher print head resolution
- They can produce photographic-quality text and images

Disadvantages

The disadvantages of Inkjet printers are :

- The ink is often very expensive.
- Many intelligent ink cartridges contain a microchip that communicates the estimated ink level to the printer; this may cause the printer to display an error message, or incorrectly inform the user that the ink cartridge is empty.
- The very narrow inkjet nozzles are prone to clogging with dried ink.

(ii) Power Connector :

(iii) Video Card :

A video card is an expansion card , which is used to produce output images to a display in a monitor. Its main purpose is to generate graphical information. It is responsible for rendering the image on the monitor of a PC . It is also known as video adapter, displayadapter or graphics card. A video card should be capable of displaying the best resolution supported by the monitor of the system. These days high performance video cards are available for gaming purposes which requires very high resolution. Video card consists of a circuit board which holds several components such as graphics processing unit (GPU), video memory, video BIOS etc. Video graphics array (VGA), Digital visual interface, high definition multimedia port etc are some of the common connection points used between video card and display.

Now-a-days, high performance video cards are available, which has higher visual capability. With increasingly popularity of computer games video cards became one of the most important parts of a computer. One disadvantage of this high performance video card is that consume high power. The amount of video memory in video card is one of the main considerations while opting for a video card. Advanced graphics port (AGP) and PCI-Express are the two commonly slots available which is used to connect a video card.

(iv) Magnetic Stripe Reader:

A magnetic reader is a hardware device which is used to read the information encoded in the magnetic stripe located at the back of a credit/debit card. A bank card holds data about the owner of the card, bank account number and code of the bank branch, where the account is held.

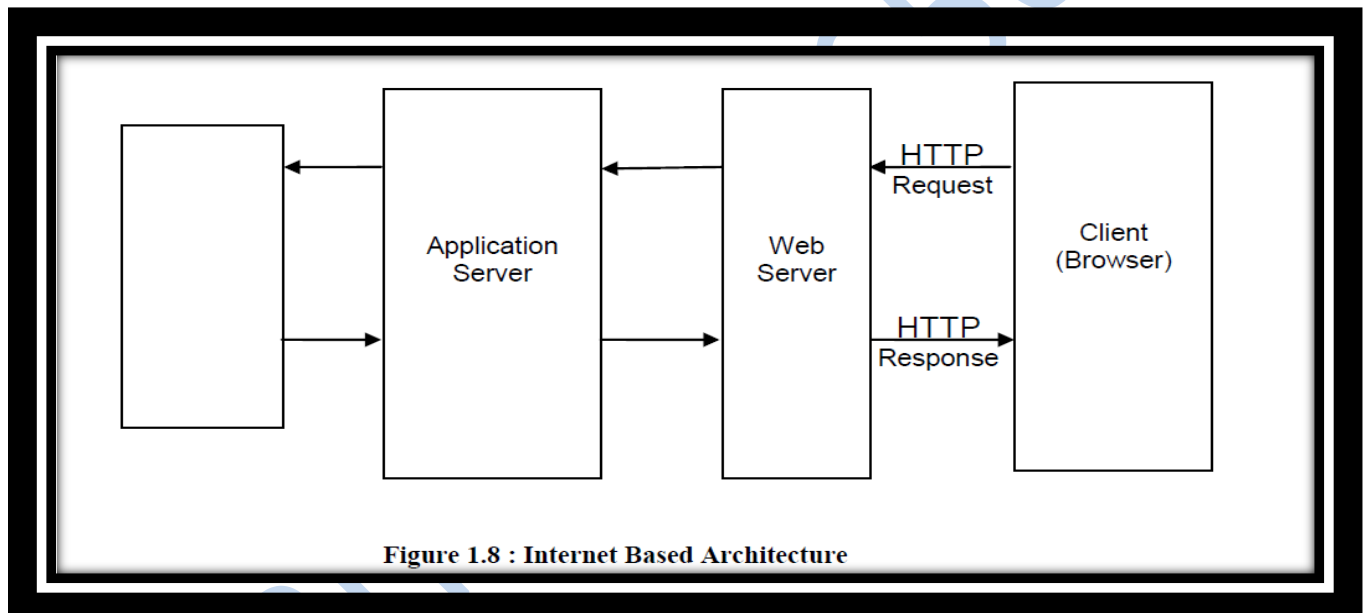
Magnetic stripe readers are often used at supermarkets and in many different types of shops. In these machines data is read electronically and the point of sale is called Electronic Point of Sale (EPOS).

Question 2: (Covers Block 2)

a) Explain the Internet Based Software Architecture with the help of a block diagram. How is this architecture different than that of 3-tier client server architecture? Explain.

Internet-based architecture: In the late 1990's, the client/server trend was augmented by the internet. The users access the web servers through the web browsers on the client machines and over the internet. This led to very thin client based applications, which reside on corporate web servers.

The advantage of web based applications is that they do not have to be tailored to run on specific platforms. But since the web applications cannot perform client-side processing, they limit the user experience by turning the client computers into —dumb terminals. Web mails, online transactions are examples of web applications.



b) What is a file and directory in the context of a computer? What are the activities involved in the file management? Explain how file management is different than the Memory Management.

FILE: A file is an object on a computer that stores data, information, settings, or commands used with a computer program. In a graphical user interface (GUI) such as Microsoft **Windows**, files display as icons that relate to the program that opens the file.

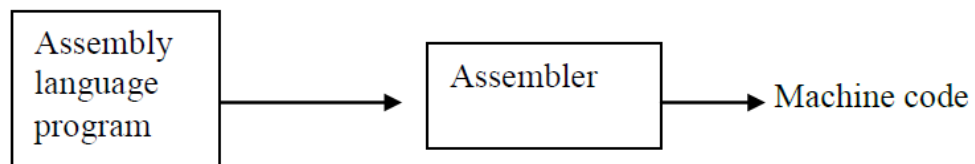
DIRECTORY: The term **directory** is used in a **computer** software **context** to refer to what appears to the user to be a container or **folder** that can hold files and other **directories**. An **inode** is a data structure on a files system that stores all the information about a file except its name and its actual data.

The concept of a file is central to the effective use of a computer system. A file is generally loosely defined as a collection of related information such as students records employee database. It might contain graphical usage. A file may be organized internally into records or it may simply be a stream of bytes. A file constitutes a *logical unit* of storage, that is, logical to the person or program using the file. The file management system provides and maintains the mapping between a file logical storage needs and the physical location where it is stored. File management system keeps track of the available space on each device connected to the system. The user and the user's program need not be aware of the underlying physical storage issues. The file management system allows the retrieval and storage of files by name, keeps track of the mappings, allocates and frees space, allows the mounting and unmounting of file structures, and provides other functions required to maintain the structures of the file system.

- Directory structures for each I/O device in the system and tools to access and move around these structures. The directory structure provisions are made to move easily from one structure to another.
- It also protects files and limit file access to authorized users

c) Explain the features and uses of the following in the context of computer software and programming:

(i) Assembler : As a program written in programming language requires a translator to translate the source program in machine code, a program written in assembly language uses the utility named as assembler for translation purpose. Assembly language is the most basic programming language available for any processor. With assembly language, a programmer works only with operations implemented directly on the physical CPU. Assembly language lacks high-level conveniences such as variables and functions, and it is not portable between various families of processors.



(ii)Interpreter : An interpreter is a program that translates each statement in the programming language into machine code and runs it. Such an arrangement means that to run the program one must always have the interpreter available.

e.g Basic , Prolog, Perl are languages that are typically interpreted.

Programs in any language can be interpreted or compiled. So there are basic compilers available as well. Compiled code runs faster and does not need the compiler at run time, whereas interpreted code is slower and needs the interpreter every time the program has to be run.

(iii)Subroutine : A subroutine is a type of subprogram, a piece of code within a larger program that performs a specific task and is relatively independent of the remaining code. It is also called a procedure, routine or a method. A subroutine has no value associated with its name. All outputs are defined in terms of arguments; there may be any number of outputs.

In most cases, a subroutine needs some information about the circumstances in which it has been called. A procedure that performs repeated or shared tasks uses different information for each call. This information consists of variables, constants, and expressions that you pass to the procedure when you call it.

For example here is a subroutine to find the sum of three numbers

```
SUBROUTINE sub1(A,B,C, SUM)
REAL A,B,C,SUM
SUM = A + B + C
RETURN
END
```

The subroutine sub1 in the main program will be invoked as follows

```
CALL sub1 (A,B,C, SUM)
```

(iv)Function : The purpose of a function is to take in a number of values or arguments, do some calculations with those arguments and then return a single result.

Each language has different rules to define a function. In the C programming language the basic block for function is given as:

return value function name (argument list)

```
{
statement;
}
```

Functions can be called from the main program or from anywhere else, even from within itself. Program control will transfer to function definition statement as soon they are called and then return back to next statement immediately after the calling point.

e.g

```
#include<stdio.h>
void main()
{
int x, y;
printf("Enter number");
scanf("%d",&y);
x=funname(y);
if(x==1)
printf("Number %d is even",y);
```

```

else
printf("Number %d is odd",y);
}
int funname(int a)
{
if((a%2)==0
)
return 1;
else return 0;
}

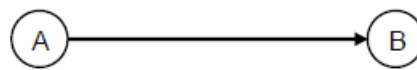
```

Question 3: (Covers Block 3)

(a) Explain the following terms in the context of computer networks:

- i) **Message switching:** Message switching is a network switching technique in which data is routed in its entirety from the source node to the destination node, one hop at a time. During message routing, every intermediate switch in the network stores the whole message. If the entire network's resources are engaged or the network becomes blocked, the message-switched network stores and delays the message until ample resources become available for effective transmission of the message.
- ii) **Simplex transmission:** In simplex mode of data communication, data flow is uni-directional. This means that data travels only in one direction i.e., from a sender to a receiver. The receiver cannot respond back to the sender. An example of simplex mode is keyboard, or a television station telecasting a program.

Simplex



Simplex – only from A to B

iii) **Optical Fiber:** An optical fiber consists of two concentric cylinders: an inner core surrounded by a cladding. Both the core and the cladding are made of transparent plastic or glass material as shown in the Figure, which transmit signals in the form of light. Optical fiber use reflections to guide light through a channel. The density of the core and cladding must differ sufficiently to reflect the beam of light instead of refracting. The core is used for guiding a light beam, whereas the cladding (which has a different refractive index) acts as a reflector to prevent the light signal instead of electrons, it does not suffer from the various noise problems associated with electromagnetic signals. The signal is usually generated by a laser or Light Emitting Diode (LED). Optical fibers can provide bandwidth to distance ratios in order of 100s of MHz per kilometer. Like other cables, hundreds of optical fibers are usually housed within one cable. They are being increasingly used as telecommunication carriers for long distance digital trunk lines. Current trends promise that they will replace twisted pair residential loops in the near future.

Advantages

- 1) Higher Band width – it can support higher band width and hence can transfer data at a higher rate.
- 2) Less signal attenuation – its transmission distance is greater than the twisted pair and it can run for 50Kms without regeneration.
- 3) Immunity to electromagnetic interface
- 4) These cables are much lighter than the copper cables
- 5) These cables are more immune to tapping than the copper cables.

Disadvantages

- 1) Installation or maintenance – it needs expertise which is not available everywhere.
- 2) Unidirectional – Propagation of light is unidirectional and we need two fibers for bidirectional communication.
- 3) Costly – the cables and interfaces used are relatively expensive.

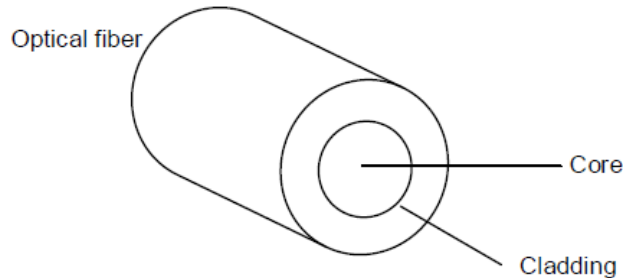


Figure 1.4 : Optical Fiber Cable

- iv) **Radio wave transmission :** Electromagnetic waves ranging in frequencies between 3 Kilo-Hertz and 1 Giga-Hertz are normally called radio waves. Radio waves are easy to generate and can travel long distances and can penetrate buildings easily, therefore widely used for communication. These are omni-directional which implies that these travel in all directions from the source, so the transmitter and receiver do not have to be carefully aligned physically. Radio signals have been used for a long time to transmit analog information. They are particularly attractive for long distance communication over difficult terrain or across the oceans, where the cost of installing cables can be too prohibitive. An increasingly-popular form of radio is cellular radio, which is currently being used by carriers for providing mobile telephone networks. These operate in the VHF (Very High Frequency) band and subdivide their coverage area into conceptual cells, where each cell represents a limited area which is served by a low-power transmitter and receiver station. As the mobile user moves from one cell area to another, its communication is handed over from one station to another. Radio waves transmitted by one antenna are susceptible to interference by another antenna due to its Omni-directional property. Radio waves can be received both inside and outside the building. Radio waves are very useful in multicasting and hence used in AM and FM radios, cordless phones and paging. You may be wondering about the term multicasting. If the communication is between single source and destination then it is called unicast; on the other hand, if one source is transmitting signal and any destination that is in the range may be able to reach it then it is called broadcast. Multicast is when a source transmits a signal for some specific group of destinations which may be more than one.

(d) Why is a networking software has layers? List and define the role of each layer of ISO-OSI model.

A layer is a collection of conceptually similar functions that provide services to the layer above it and receives service from the layer below it. On each layer an *instance* provides services to the instances at the layer above and requests service from the layer below. For example, a layer that provides error-free communications across a network provides the path needed by applications above it, while it calls the next lower layer to send and receive packets that make up the contents of the path. Any two instances at one layer are connected by a horizontal protocol connection on that layer

The following are the layers of OSI model:

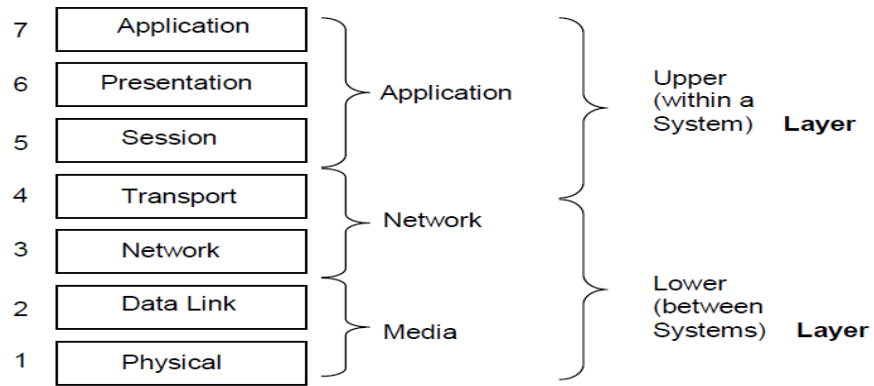


Figure 1.13: OSI Model

Application Layer: This layer is the layer for user interaction. We must have application software for dealing with the data.

Presentation Layer: It converts the data into suitable format. It does tasks like compression, decompression, encryption and decryption.

Session Layer: This layer manages connections between different application layers.

Transport Layer: This layer converts data into segments and re-assembles the data stream. TCP and UDP are the protocols used in this layer. In this layer, data is converted into so called segments.

Network Layer: This layer translates logical address into physical address. This layer also fixes the route for data path. Router works in this layer. In this layer data is called a packet.

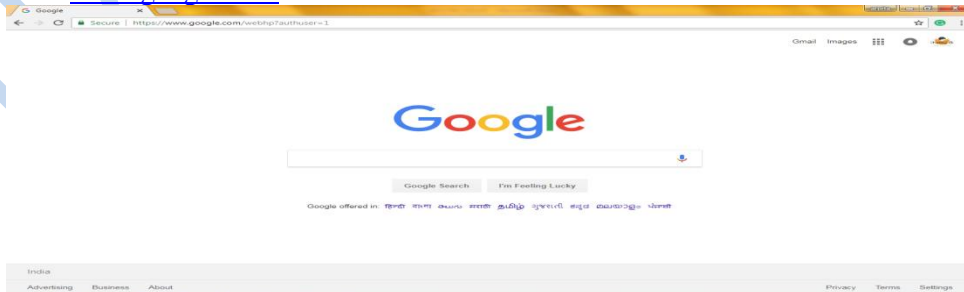
Data-Link Layer: This layer provides physical identification of a device using Media Access Control Address. It adds source and destination address to packets and convert them into frames. This is the layer that provides error free transmission.

Physical Layer: This layer provides the functional requirements for activating a physical link. In this layer, data is carried from one device to another.

(e) You want to find about the Universities that offer Programmes in Computer Science and Information Technology but does not offer programmes in Medical Science. Make efficient query or queries that will show the desired result as above. Also explain the activities performed by a search engine

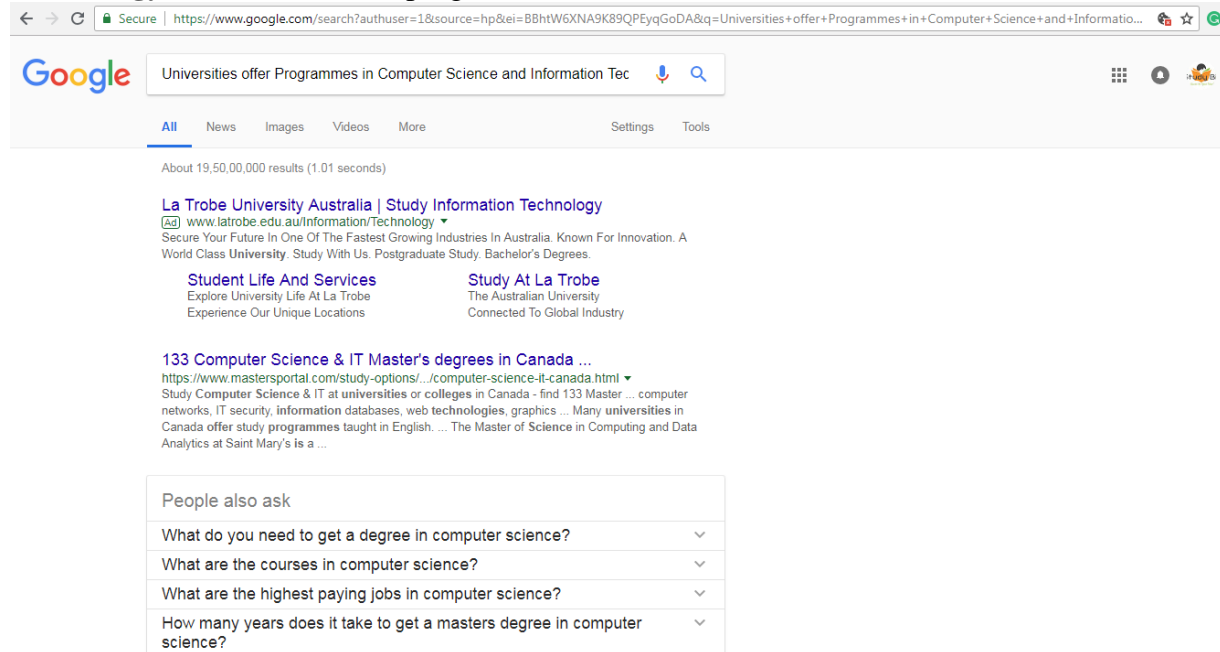
1. go to web browser

2. write www.google.com



3.

4. write which Universities offer Programmes in **Computer Science and Information Technology** but does not offer programmes in **Medical Science**.



Activities performed by a search engine:

A search engine can be defined as a tool to search diverse and disorganized sources of information available on the Internet. You can clearly visualize from this definition that a search engine has to use some automated programs that needs to continuously keep visiting the web pages about the content they have and organize the information about web pages in some format. Programs that continuously keep searching for information from web pages are called -spiders, robots, crawlers, wanderers and worms. Search engines finds, classifies and stores information about the contents of various websites on the Internet.

(f) Explain the following in the context of Internet and its applications:

(i) **Security threats on Internet :**

- **Confidentiality:** No unauthorized person should be able to read or copy information that s/he is not supposed to read.
- **Integrity:** No unauthorized person should be able to modify information.
- **Availability:** No unauthorized person should be able to erase information or make it inaccessible.

The other threats posed on the Internet are due to Computer Viruses and identity information thefts.

(ii) **E-learning processes :** Some of the activities that may be undertaken by students in the e-learning process:

- Login.
- Content access and assimilation.
- undertake formative assessment online.

- formative assessment using assignments and discussions.
- Getting the feedback on formative assessment and working towards achieving learning outcomes.
- Communication with the students through various means like; email, chat, SMS, and other means.
- Go through a summative assessment.
- Measuring the effectiveness of e-learning and performance assessment.
- Recoding student achievements and certification.

Please note that it is not necessary that all the e-learning system have all such activities. However, a good e-learning system should have most of these activities.

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