Q 2 (a) Why CPU is called brain of the computer? Draw the block diagram of a computer.
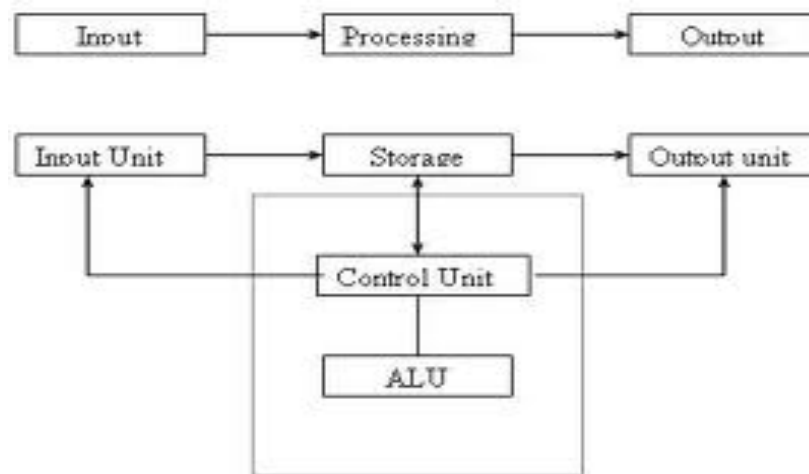
Answer

CPU stands for CENTRAL PROCESSING UNIT.

All of the information goes through that device. It reads the information, somehow breaks it down into some sort of data it can decipher and makes a "decision" what to display as the final information.
Example:
When you type in a website it transfers what you type into a number code and tells the internet server what you want to view.
When you click on a saved program, it looks at the request you made, goes looking for matching information in the memory bank and on the hard drive and splashes the information on the monitor.
It does what the human brain does in some respects so comparing it to a brain just seemed logical.

Q 2 (c) Convert $(217)_{10}$ to Binary number.

Answer $(11011001)_2$

Q 3 (a) Explain the functioning of inkjet printer.

Answer
An **inkjet** printer is any printer that places extremely small droplets of ink onto paper to create an image. If you ever look at a piece of paper that has come out of an inkjet printer, you know that:

- The dots are extremely small (usually between 50 and 60 microns in diameter), so small that they are tinier than the diameter of a human hair (70 microns)!

- The dots are positioned very precisely, with resolutions of up to 1440x720 dots per inch (dpi).

The dots can have different colors combined together to create photo-quality images.

Q 3 (b) Discuss the various output units of a computer.

Answer
(a) Monitor
Monitor is an output device that resembles the television screen and uses a Cathode Ray Tube (CRT) to display information. The monitor is associated with a keyboard for manual input of characters and displays the information as it is keyed in. It also displays the program or application output. Like the television, monitors are also available in different sizes.

(b) Liquid Crystal Display (LCD)
LCD was introduced in the 1970s and is now applied to display terminals also. Its advantages like low energy consumption, smaller and lighter have paved its way for usage in portable computers (laptops).

(c) Printer
Printers are used to produce paper (commonly known as hardcopy) output. Based on the technology used, they can be classified as Impact or Non-impact printers.
Impact printers use the typewriting printing mechanism wherein a hammer strikes the paper through a ribbon in order to produce output. Dot-matrix and Character printers fall under this category.
Non-impact printers do not touch the paper while printing. They use chemical, heat or electrical signals to etch the symbols on paper. Inkjet, Deskjet, Laser, Thermal printers fall under this category of printers.
When we talk about printers we refer to two basic qualities associated with printers: resolution, and speed. Print resolution is measured in terms of number of dots per inch (dpi). Print speed is measured in terms of number of characters printed in a unit of time and is represented as characters-per-second (cps), lines-per-minute (lpm), or pages-per-minute (ppm).

(d) Plotter
Plotters are used to print graphical output on paper. It interprets computer commands and makes line drawings on paper using multicolored automated pens. It is capable of producing graphs, drawings, charts, maps etc.
Computer Aided Engineering (CAE) applications like CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) are typical usage areas for plotters.

(e) Audio Output: Sound Cards and Speakers:
The Audio output is the ability of the computer to output sound. Two components are needed: Sound card – Plays contents of digitized recordings, Speakers – Attached to

sound card.

Q 3 (c) What is an assembler? How it works?

Answer
The assembler works in two passes:
 pass1
   input scanning, collect symbols, generate token list
 pass2
   generate object code from the token list
input scanning

symbol table

The predefined symbols are: opcode, r0..r31, conditional. opcode are ld st jmp jal jr add sub mul div and or xor shl shr trap. conditional are: always eq neq lt le ge gt.

pass 1
collect symbols and resolve reference
  build symbol table
  store token list
token list is an array of token. Each token stores type, mode, reference and line number (refer to source code line number). line number is used in reporting error. Type is: sym num op dot. Mode is addressing mode: absolute, displacement, index, immediate, reg-reg, reg-imm, special.

For example ld r1 @lv1 base will generate the list of four tokens:
(notation : {type,mode,ref})
```
{ {op,disp,ld}, {sym,reg,r1}, {sym,disp,lv1}, {sym,reg,base} }
```

pass 2
generate code from token list
output format is suitable for a loader of the simulator

```
a num               set address
{l,d,x} num+        instruction
w num               defined word
e                   end of file
```

Q 4 (b) Give the differences between LAN and WAN.

Answer
A LAN is a Local Area Network. Local is generally referred to a network contained within a building or an office or a campus. You might have a LAN for example on a University campus or between office blocks in an office park.

A big corporate perhaps like Anglo American, would generally have a LAN that might span several buildings.

To set up a LAN -relatively speaking- is cheap. If you want to put an extra couple of network points or an extra couple of devices on the network

A WAN is generally slow. If we compare that to a LAN, we said that Ethernet could run up to 1000 Mbps, currently, certainly in South Africa, the fastest WAN is 155 Mbps, so you can see in a LAN we can talk up to 1000 Mbps whereas in a WAN, at the moment, currently, WAN is expensive. If we look at the path of telecommunications, we need to connect two offices, one in Pretoria and one in Johannesburg together - it's an expensive operation even for a slow line.

Q 4 (c) How microcomputer is different from mini and mainframe computers?

Answer
Mainframes

Mainframe computers are large, powerful computers capable of handling processing requests for large numbers of users simultaneously. For this reason, they are commonly used in large organisations such as governments and banks. In fact, a large percentage of the World's Fortune 500 companies all use mainframe computers for mission-critical functions. In terms of capital outlay, they generally cost hundreds of thousands to install.

Traditionally, users would connect to a mainframe using a terminal which allowed them to input requests to the mainframe. The mainframe would then handle all the computing before outputting a response. These terminals were called 'dumb terminals' because they had no data-processing abilities of their own; they were simply windows through which users could access the mainframe. These days, terminal emulation software such as 3270 emulation is used in place of a terminal

3. Minicomputers

A step down from mainframes, minicomputers are multi-user machines that first became available in the 1960s with the arrival of the integrated circuit. It was the integrated circuit that enabled computer manufacturers to build computers that were much cheaper than mainframes while still boasting tremendous processing power. As a result, smaller organisations were able to take advantage of the processing power of computers, where in the past such abilities were the sole domain of mega corporations.

These days, minicomputers are considered the "middle" of the computing spectrum, and are commonly referred to as "midrange" computers.

4. Microcomputers

You're probably reading this article thanks to a microcomputer right now. The term refers to computer that have microprocessor chip as its central processing unit (CPU). Commonly referred to as personal computers (because, unlike mainframes and midrange computers, they are only designed to be used by a single person at any given time), they come in many different forms, including:

- Desktop PCs (From Windows machines to iMacs, these are computers that sit on your desk and don't generally move from that location.)
- Laptop PCs (Designed for mobility, laptops can be taken with you anywhere you go and, despite their size, are becoming increasingly fast and powerful)

Tablets and smartphones (Recently gaining popularity due to Apple devices such as the iPhone and iPad, these are handheld PCs which usually have touchscreen capabilities and are usually complemented by many "apps" that allow the user to achieve a huge range of tasks.

Q 4 (d) How does world wide web work? What is IP address?

Answer
The internet is a network. The world wide web is an application that works with the internet. There are different services that the internet provides. The world wide web is one of these services. Read on for a high level explanation of how it works.

The World wide web, or web for short, works on the http protocol. Http stands for hypertext Transfer protocol. The web is a client server application. The servers are connected to the web and listen for requests via the internet. These web servers are running an http server of some kind. The most popular is the apache web server.

It is the job of the web server to receive requests and formulate responses to those requests. The URL tells which document to use in the response. The servers serves as just a part of the URL. The URL consists of protocol://server.name.com/path/to/document.html. In an http request the protocol is http. The server retrieves the indicated document and formulates a response which is sent back to the client.

The client is one of any number of applications that understands how to make requests, and read responses. The most popular clients for surfing the web are web browsers like Internet Explorer, or Safari.

It is the job of these browsers to "render" the page for the user. It then waits for either a link to be clicked on or a new URL to be entered into the URL entry area. It then formulates an http request which it passes to the server via the internet. It waits for a response. When it receives, the response it renders the page to the user. The whole cycle consists of a request followed by a response.

This is how the world wide web works at a very high level.

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It is the job of the web server to receive requests and formulate responses to those requests. The URL tells which document to use in the response. Remember in our last discussion we were interested in the server and how we found it. The servers serves as just a part of the URL. The URL consists of protocol://server.name.com/path/to/document.html. In an http request the protocol is http. The server retrieves the indicated document and formulates a response which is sent back to the client.

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This is how the world wide web works at a very high level

An IP address is a fascinating product of modern computer technology designed to allow one computer (or other digital device) to communicate with another via the Internet. IP addresses allow the location of literally billions of digital devices that are connected to the Internet to be pinpointed and differentiated from other devices. In the same sense that someone needs your mailing address to send you a letter, a remote computer needs your IP address to communicate with your computer.

"IP" stands for Internet Protocol, so an IP address is an Internet Protocol address. What does that mean? An Internet Protocol is a set of rules that govern Internet activity and facilitate completion of a variety of actions on the World Wide Web. Therefore an Internet Protocol address is part of the systematically laid out interconnected grid that governs online communication by identifying both initiating devices and various Internet destinations, thereby making two-way communication possible.

An IP address consists of four numbers, each of which contains one to three digits, with a single dot (.) separating each number or set of digits. Each of the four numbers can range from 0 to 255. Here's an example of what an IP address might look like: 78.125.0.209. This innocuous-looking group of four numbers is the key that empowers you and me to send and retrieve data over our Internet connections, ensuring that our messages, as well as our requests for data and the data we've requested, will reach their correct Internet destinations. Without this numeric protocol, sending and receiving data over the World Wide Web would be impossible.

IP addresses can be either static or dynamic. Static IP addresses never change. They serve as a permanent Internet address and provide a simple and reliable way for remote computers to contact you. Static IP addresses reveal such information as the continent, country, region, and city in which a computer is located; the ISP (Internet Service Provider) that services that particular computer; and such technical information as the precise latitude and longitude of the country, as well as the locale, of the computer. Many websites provide IP address look-up services to their visitors, free of charge. If you're curious about your own IP address, you can locate these websites by performing a Google search.

Dynamic IP addresses are temporary and are assigned each time a computer accesses the Internet. They are, in effect, borrowed from a pool of IP addresses that are shared among various computers. Since a limited number of static IP addresses are available, many ISPs reserve a portion of their assigned addresses for sharing among their subscribers in this way. This lowers costs and allows them to service far more subscribers than they otherwise could.

Static IP addresses are generally preferable for such uses as VOIP (Voice over Internet Protocol), online gaming, or any other purpose where users need to make it easy for other computers to locate and connect to them. Easy access can also be facilitated when using a dynamic IP address through the use of a dynamic DNS service, which enables other computers to find you even though you may be using a temporary, one-time IP address. This often entails an extra charge, however, so check with your ISP.

Static IP addresses are considered somewhat less secure than dynamic IP addresses, since they are easier to track for data mining purposes. However, following safe Internet practices can help mitigate this potential problem and keep your computer secure no matter what type of IP address you use.

Q 5 (a) What are elements of a user-defined function? Write a program in C to find the factorial of a number using function.

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Q 5 (b) Differentiate between Call by value & Call by reference by giving suitable example.

Answer

Call by value and call by reference

Call by Value	Call by Reference
This is the usual method to call a function in which only the value of the variable is passed as an argument	In this method, the address of the variable is passed as an argument
Any alternation in the value of the argument passed is local to the function and is not accepted in the calling program	Any alternation in the value of the argument passed is accepted in the calling program(since alternation is made indirectly in the memory location using the pointer)
Memory location occupied by formal and actual arguments is different	Memory location occupied by formal and actual arguments is same and there is a saving of memory location
Since a new location is created, this method is slow	Since the existing memory location is used through its address, this method is fast
There is no possibility of wrong data manipulation since the arguments are directly used in an application	There is a possibility of wrong data manipulation since the addresses are used in an expression. A good skill of programming is required here

Q 6 (a) Write a program to reverse the entire sequence using array.

Answer

```
#include <stdio.h>

int main()
{
  int n, c, d, a[100], b[100];

  printf("Enter the number of elements in array\n");
  scanf("%d", &n);

  printf("Enter the array elements\n");

  for (c = 0; c < n ; c++)
    scanf("%d", &a[c]);

  /*
   * Copying elements into array b starting from end of array a
```

```
   */

   for (c = n - 1, d = 0; c >= 0; c--, d++)
     b[d] = a[c];

   /*
    * Copying reversed array into original.
    * Here we are modifying original array, this is optional.
    */

   for (c = 0; c < n; c++)
     a[c] = b[c];

   printf("Reverse array is\n");

   for (c = 0; c < n; c++)
     printf("%d\n", a[c]);

   return 0;
}
```

Q 6 (b) Write a program to calculate the number of vowels in a given string.

Answer

```
1.    #include<conio.h>
2.  #include<ctype.h>
3.
4.  int vowels(char*);
5.
6.  void main()
7.  {
8.        char string[30];
9.        int len;
10.
11.       clrscr();
12.       printf("\nEnter string: ");
13.       gets(string);
14.
15.       len=vowels(string);
16.
17.       printf("\nNo. of vowels = %d",len);
18.       getch();
19. }
20.
21. int vowels(char *s)
```

```
22.  {
23.         int count=0;
24.         char ch;
25.         while(*s!='\0')
26.         {
27.                 ch=tolower(*s);
28.                 if(ch=='a'||ch=='e'||ch=='i'||ch=='o'||ch=='u')
29.                         count++;
30.                 s++;
31.         }
32.         return count;
}
```

Q 7 (b) Using a suitable example, explain the use of switch statement instead of multiple if-else statements

Answer Page Number 129-132 of Text Book

Q 8 (a) Define the following:
　　　　　(i) getch()　　　　　　　　　　**(ii) getchar()**
　　　　　(iii) getche()　　　　　　　　　**(iv) fflush()**

Answer
i) getch() after accepting a char terminates the program without displaying the character.
ii) getchar() reads a character n simply displays it on the screen while execution
iii) getche() accepts a character, displays it n then terminates the program.
iv) fflush()fflush() is one of the standard C routines for file manipulation. It causes the currently pending data, if any, to be 'flushed' (written) to disk. When you call fwrite(), the data may not be written to disk but may be storead in an internal buffer in order to speed up successive writes. fflush() writes the buffer to disk if it has unwritten data in it.

It's use is not required, but useful if you want to be absolutely sure that some set of writes has completed before, say, responding to a request. That way, should the machine crash your data is likely to be safe on disk.

Q 8 (b) Discuss different types of operator used in C language along with examples.

Answer
1. artimetical operator
2. logical operator
3. relational operator
4. conditional operator
5. increment & decrement operator
6. comma operator

Q 9 (b) Give the difference between the followings:
   (i) getw() and putw()
   (ii) fprintf and fscanf()

Answer

These are integer-oriented functions. They are similar to get c and putc functions and are used to read and write integer values. These functions would be usefull when we deal with only integer data. The general forms of getw and putw are:

putw(integer,fp);

getw(fp);

/*Example   program   for   using   getw   and   putw   functions*/
#include< stdio.h >

main()
{
FILE *f1,*f2,*f3;

int number I;

printf("Contents of the data filenn");

f1=fopen("DATA","W");
for(I=1;I< 30;I++)

{
scanf("%d",&number);
if(number==-1)
break;
putw(number,f1);
}

```
fclose(f1);
f1=fopen("DATA","r");
f2=fopen("ODD","w");
f3=fopen("EVEN","w");
while((number=getw(f1))!=EOF)/* Read from data file*/

{
if(number%2==0)
putw(number,f3);/*Write to even file*/

else
putw(number,f2);/*write to odd file*/

}
fclose(f1);
fclose(f2);
fclose(f3);
f2=fopen("ODD","r");
f3=fopen("EVEN","r");
printf("nnContents of the odd filenn");

while(number=getw(f2))!=EOF)
printf("%d%d",number);
printf("nnContents of the even file");

while(number=getw(f3))!=EOF)
printf("%d",number);
fclose(f2);
fclose(f3);
}
```

ii) The fprintf and fscanf functions are identical to printf and scanf functions except that they work on files. The first argument of theses functions is a file pointer which specifies the file to be used. The general form of fprintf is

fprintf(fp,"control string", list);

Where fp id a file pointer associated with a file that has been opened for writing. The control string is file output specifications list may include variable, constant and string.

fprintf(f1,%s%d%f",name,age,7.5);

Here name is an array variable of type char and age is an int variable The general format of fscanf is

fscanf(fp,"controlstring",list);

This statement would cause the reading of items in the control string.

Text Book

1. Fundamentals of Computers, V. Rajaraman, Fourth Edition, PHI, 2007

2. Programming in ANSI C, E. Balagurusamy, Third Edition, Tata McGraw Hill