

3.what is the difference between multitasking and multiprogramming os

3. Multiprogram	Multitask
in MP multiple processes run at same time on a single processor	MT is when more than one task is executed at single time utilizing multiple CPU.
based on concept of context switching	based on concept of time sharing
utilizes single CPU	multiple CPU
takes more time to execute processes	takes less time to execute processes
idea is to reduce CPU idle time	idea is to allow multiple processes to run at same time via time sharing

2. who Invented c and Linux

c - Dennis Ritchie Linux - Linus Torvalds

1.size of long long int, size of long double, size of 3.14

- short int - 2
unsigned short int - 2
unsigned int - 4
int - 4
float - 4
double - 8 (double floating)
long double - 16
long int - 4
char - 1

4.what is binary coded decimal

A system for coding a number in which each digit of a decimal number is represented individually by its binary equivalent

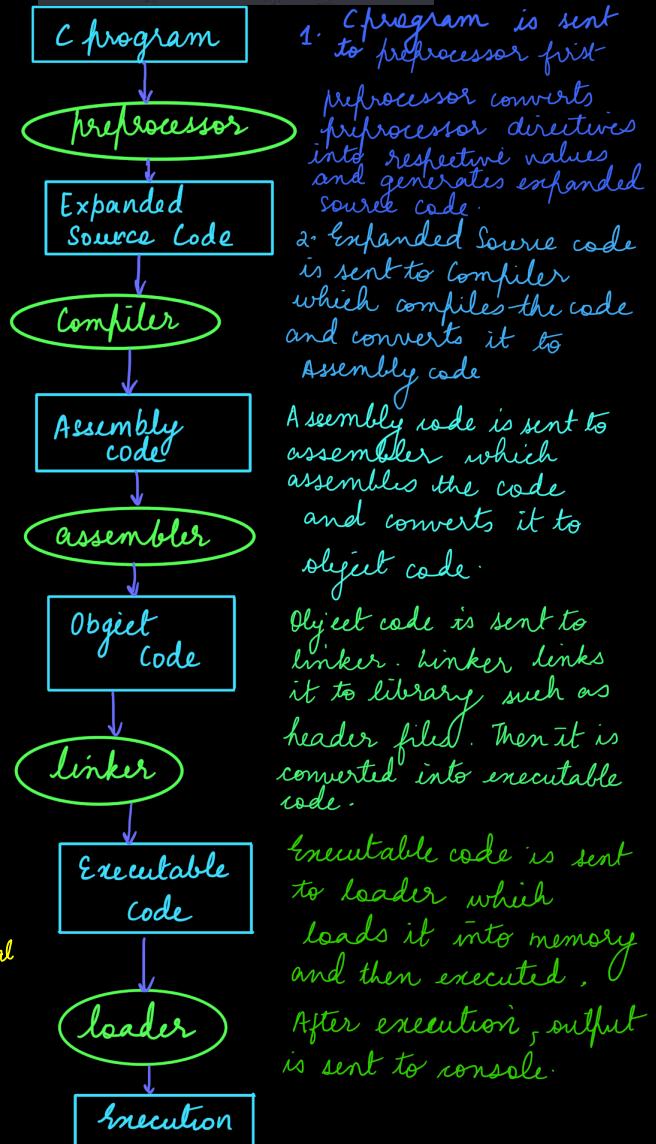
5.what is the drawback of one's complement

In ones complements method there are two zeroes $\rightarrow +0, -0$ which is problematic $0(0000 \text{ and } 1111)$

6.what do you mean by algorithms,advantages of algo

A set of instructions for solving a problem or accomplishing a task.
Advantages \rightarrow acts as blueprint of a program and helps during program procedure

7.lifecycle of c program



8.storage class specifiers - scope and life

Storage classes are used to describe the features of a variable / function like SCOPE, VISIBILITY & LIFE-TIME
C uses 4 storage classes

Storage Specifier	Storage	Initial Value	Scope	Life
auto	Stack	Garbage	within block	end of block
extern	Data Segment	0	Global multiple files	till end of program
Static	Data Segment	0	within block	till end of program
Register	CPU register	Garbage	within block	end of block

Scope determines the life of a variable

9.Header file of malloc, calloc

<stdlib.h>

10.use of #define

The #define preprocessor directive is used to define constant or macro substitution

A macro is a fragment of code that is given a name. You can define a macro in C using #define preprocessor directive

eg #define C 299792458

here when we use C in the program it is replaced with 299...

11.return type of size of operator

It returns an unsigned integer type of at least 16 bit

13.what is XOR operator

`^` (bitwise XOR) in C takes two numbers. The result of XOR is 1 if the numbers are different. and returns 0 if the numbers are same

14. Define typedef and enum

typedef is a keyword used to assign alternative names to existing datatype. Eg when names of datatype becomes too complicated to use in programs.

SYNTAX

`typedef <existing-name> <alias-name>`

eg `typedef unsigned long ulong;`

It can also be used to give a name to a user defined data type as well.

eg `typedef struct Elektra`

15.range of long int

TYPE	STORAGE SIZE	RANGE
char	1 byte	-128 to 127 / 0 - 255 signed unsigned
int	2 or 4 bytes	-32,768 to 32,767 or -2,147,483,648 to 2,147,483,647 signed ↗ 0 - 65,535 or 0 - 4,294,967,295 unsigned int ↗
short or short int	2 bytes	-32,768 to 32,767 signed ↗ 0 - 65,535 ↙ unsigned
long or long int	8 bytes or (4 for 32 int)	-9 × 10 ¹⁸ to 9 × 10 ¹⁸ signed ↗ 0 to 18 × 10 ¹⁸ ↙ unsigned

TYPE	STORAGE SIZE	RANGE	PRECISION
float	4 byte	1.2×10^{-38} to 3.4×10^{38}	6 decimal places
double	8 byte	2.3×10^{-308} to 1.7×10^{308}	15 decimal places
long double	10 byte	3.4×10^{-4932} to 1.1×10^{4932}	19 decimal places

16.define bios, Post

The BIOS is firmware which contains information for hardware, operating systems and drivers to interface with the motherboard components. It stores information concerning what hardware is available.

The POST is the Power On Self Test which the BIOS runs when you power on the computer. It tests the various components to ensure correct function before passing program control to the boot system on the device selected as the boot device in the BIOS settings.

17.advantage of functions

- Enhances Readability
- Control flow can be easily managed
- Reduces complexity
- For reusability

18.explain pointer arithmetic

A pointer in C is an address, which is a numeric value. Therefore, you can perform arithmetic operations on a pointer just as you can on a numeric value. There are four arithmetic operators that can be used on pointers: `++`, `--`, `+`, and `-`.

1. Increment & Decrement

```
eg ptr1 = &N;
printf("%p", ptr1);
ptr1++;
printf("%p", ptr1);
```

OUTPUT : 0x 950 0x 954 (4 is size of int)

```
eg ptr1 = &N;
printf("%p", ptr1),
ptr1--;
printf("%p", ptr1);
```

OUTPUT 0x 956 0x 952 (4 is size of int)

ADDITION

when a pointer is added with a value then

```
pointer = pointer + (value * size of data)
ptr2 = 0x 770
```

```
eg ptr2 = ptr2 + 3
print(ptr2)
output = 0x 776 )
```

SUBTRACTION

```
ptr2 = 0x 770
```

```
eg ptr2 = ptr2 - 3
print(ptr2)
output = 0x 764
```

SUBTRACTION OF 2 POINTERS

possible only when pointers are of same type

```
eg ptr1 = &N ; ptr2 = &N ;
ptr2 += 3 ;
int x = ptr2 - ptr1 ;
print(x)
OUTPUT = 3
```

19. Use of 2 D arrays

It is convenient to store data in the form of a grid or table with rows and columns.

20.explain bubble sort

Bubble sort, sometimes referred to as sinking sort, is a simple sorting algorithm that repeatedly steps through the list, compares adjacent elements and swaps them if they are in the wrong order. The pass through the list is repeated until the list is sorted.

21.define dynamic memory allocation

Since C is a structured language, it has some fixed rules for programming. One of them includes changing the size of an array. If we want to change the size of the array we have to use dynamic memory allocation

22.define memory leak

A memory leak is a type of resource leak that occurs when a computer program incorrectly manages memory allocations in a way that memory which is no longer needed is not released. A memory leak may also happen when an object is stored in memory but cannot be accessed by the running code.

memory allocated must always be freed

23.what are the 3 levels of cache memory.

Cache memory, also called CPU memory, is high-speed static random access memory (SRAM) that a computer microprocessor can access more quickly than it can access regular random access memory (RAM).

Cache memory is fast and expensive. Traditionally, it is categorized as "levels" that describe its closeness and accessibility to the microprocessor. There are three general cache levels:

L1 cache, or primary cache, is extremely fast but relatively small, and is usually embedded in the processor chip as CPU cache.

L2 cache, or secondary cache, is often more capacious than L1. L2 cache may be embedded on the CPU, or it can be on a separate chip or coprocessor and have a high-speed alternative system bus connecting the cache and CPU. That way it doesn't get slowed by traffic on the main system bus.

Level 3 (L3) cache is specialized memory developed to improve the performance of L1 and L2. L1 or L2 can be significantly faster than L3, though L3 is usually double the speed of DRAM. With multicore processors, each core can have dedicated L1 and L2 cache, but they can share an L3 cache. If an L3 cache references an instruction, it is usually elevated to a higher level of cache.

24.How do you run a program in the Linux terminal

```
gcc a.c -o a -Wall  
./a
```

25.explain construction of hard disk drive

Hard disks are rigid platters, composed of a substrate and a magnetic medium. The substrate – the platter's base material – must be non-magnetic and capable of being machined to a smooth finish. It is made either of aluminum alloy or a mixture of glass and ceramic.

26.role of os

An operating system has three main functions: (1) manage the computer's resources, such as the central processing unit, memory, disk drives, and printers, (2) establish a user interface, and (3) execute and provide services for applications software.

27.name the three different modes in vi editor

COMMAND MODE → When vi starts up, it is in command mode. This mode allows us to move, delete, copy & paste files.

INSERT MODE → This mode enables you to insert text into the file. To come to insert mode, press **i**

LAST LINE MODE (ESCAPE MODE) → This mode lets you perform tasks like saving files, executing commands etc. To come to insert mode, press **:**

28.what are different types of registers

Registers are very fast computer memory which are used to execute programs and operations efficiently

The sole purpose of having register is fast retrieval of data for processing by CPU. Though accessing instructions from RAM is comparatively faster with hard drive, it still isn't enough for CPU. For even better processing, there are memories in CPU which can get data from RAM which are about to be executed beforehand. After registers we have cache memory, which are faster but less faster than registers.

ACCUMULATOR → • Most frequently used to store data

Memory Address Registers (MAR) → holds address of the location to be accessed from memory

Memory Data Registers (MDR) → contains data to be written or read out from addressed location

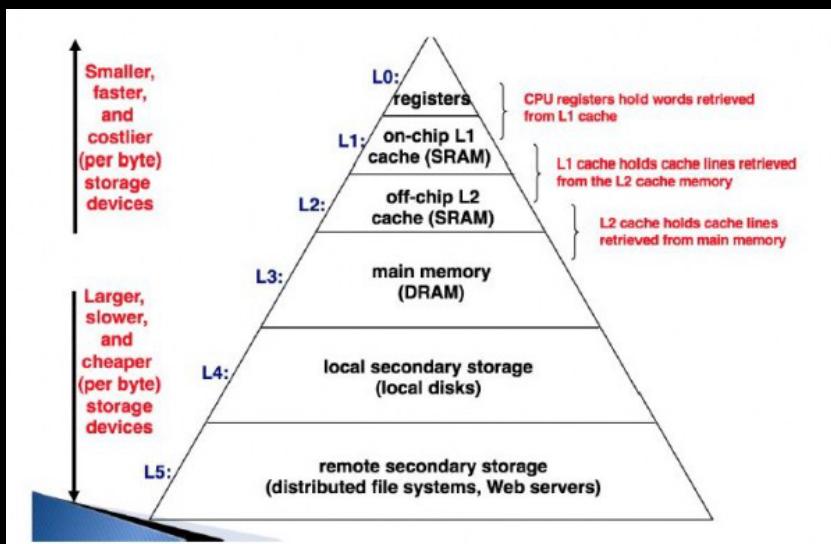
General Purpose Registers → used to store temporary data during ongoing operations

Program Counter (PC) → tracks execution of program

Instruction Register → holds the instruction which has to be executed.

Condition Code Register → It contains diff flags that indicate status of any operation.

29. explain memory hierarchy



The memory in a computer can be divided into five hierarchies based on the speed as well as use. The processor can move from one level to another based on its requirements. The five hierarchies in the memory are registers, cache, main memory, magnetic discs, and magnetic tapes. The first three hierarchies are volatile memories which mean when there is no power, and then automatically they lose their stored data. Whereas the last two hierarchies are not volatile which means they store the data permanently.

30. Explain associativity and precedence with an example

Operators Precedence and Associativity are two characteristics of operators that determine the evaluation order of sub-expressions in absence of brackets

Operator precedence determines which operator is performed first in an expression with more than one operators with different precedence.

Eg

$10 + 20 * 30$ is calculated as $10 + (20 * 30)$ and not as $(10 + 20) * 30$

Operators Associativity is used when two operators of same precedence appear in an expression. Associativity can be either Left to Right or Right to Left.

example:

** and $^/$ have same precedence and their associativity is Left to Right, so the expression " $100 / 10 * 10$ " is treated as " $(100 / 10) * 10$ ".

31. What is EEPROM

EEPROM (electrically erasable programmable read-only memory) is user-modifiable read-only memory (ROM) that can be erased and reprogrammed (written to) repeatedly through the application of higher than normal electrical voltage.

Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip has to be erased and reprogrammed in its entirety, not selectively. It also has a limited life - that is, the number of times it can be reprogrammed is limited to tens or hundreds of thousands of times.

32.what is cache

A cache is a reserved storage location that collects temporary data to help websites, browsers, and apps load faster. Whether it's a computer, laptop or phone, web browser or app, you'll find some variety of a cache.

33. Difference between switch case and nested if else

DIFFERENCE B/W “NESTED-IF-ELSE” AND “SWITCH” STATEMENTS

NESTED IF-ELSE STATEMENT	SWITCH STATEMENT
i. It becomes complicated for multiple selections.	It is easy to understand for multiple selections.
ii. It uses an independent expression for each case.	It uses a single expression for all cases, but each case must have a constant value of integer type or character type.
iii. The test condition can be given in a special range of value. If the given condition matches then the statements under it will be executed.	Only a single expression is given in the switch statement which returns a single value. The test condition cannot be given in a specified range. It is drawback.

36. Call by value vs call by reference

Call by value	Call by reference
In call by value method, the value of the actual parameters is copied into the formal parameters. In other words, we can say that the value of the variable is used in the function call in the call by value Method	In call by reference, the address of the variable is passed into the function call as the actual parameter.
In call by value method, we can not modify the value of the actual parameter by the formal parameter.	The value of the actual parameters can be modified by changing the formal parameters since the address of the actual parameters is passed.
In call by value, different memory is allocated for actual and formal parameters since the value of the actual parameter is copied into the formal parameter.	In call by reference, the memory allocation is similar for both formal parameters and actual parameters. All the operations in the function are performed on the value stored at the address of the actual parameters, and the

34 define recursion

The process in which a function calls itself directly or indirectly is called recursion and the corresponding function is called as recursive function.

35.give the syntax of structure and what is structure variable

```
Syntax of struct
struct structureName {
    dataType member1;
    dataType member2;
    ...
};

For example,
struct StudentData{
    char *stu_name;
    int stu_id;
    int stu_age;
};

int main()
{
    /* student is the variable of structure StudentData*/
    struct StudentData student;

    /*Assigning the values of each struct member here*/
    student.stu_name = "Steve";
    student.stu_id = 1234;
    student.stu_age = 30;

    /* Displaying the values of struct members */
    printf("Student Name is: %s", student.stu_name);
    printf("\nStudent Id is: %d", student.stu_id);
    printf("\nStudent Age is: %d", student.stu_age);
    return 0;
}
```

A structure is a key word that creates user defined data type in C/C++. A structure creates a data type that can be used to group items of possibly different types into a single type.

37.define ternary operator

The conditional operator ?:, also known as the ternary conditional operator, evaluates a Boolean expression and returns the result of one of the two expressions, depending on whether the Boolean expression evaluates to true or false. If the expression is true the value before the : is the result and vice versa.

38. Role of compiler, loader, linker..

A Compiler translates lines of code from the programming language into machine language. A Linker creates a link between two programs. A Loader loads the program into memory in the main database, program, etc.

The main difference between linker loader and compiler is that the linker combines one or more object files generated by the compiler to a single executable file. Meanwhile, a loader places the programs into memory and prepares them for execution while the compiler converts the source code into object code.

40.explain different variations of cd command

cd [directory]

To move inside directory

cd /

To change directory to root directory

cd ~ or cd

To change directory to home directory

cd ..

To move to parent directory of current directory.

39. linux commands - mkdir, top, echo,..

The top command (table of processes) displays the processor activity of your Linux box and also displays tasks managed by the kernel in real-time. It also shows information about CPU and memory utilization of a list of running processes.

echo command in linux is used to display line of text/string that are passed as an argument.

\$ echo Tecmint is a community of Linux Nerds

Outputs:

Tecmint is a community of Linux Nerds

echo * : this command will print all files/folders, similar to ls command .

The echo can be used with a redirect operator to output to a file and not standard output.

\$ echo "Test Page" > testpage

Check Content

avi@tecmint:~\$ cat testpage

Test Page

```

raghvendra@raghvendra-Inspiron-15-3567: ~
File Edit View Search Terminal Help
raghvendra@raghvendra-Inspiron-15-3567:~$ echo "Geeks for Geeks"
Geeks for Geeks
raghvendra@raghvendra-Inspiron-15-3567:~$ 

```

41.use of free command in Linux

In Linux systems, you can use the free command to get a detailed report on the system's memory usage. The free command provides information about the total amount of the physical and swap memory, as well as the free and used memory.

// using free command

\$free

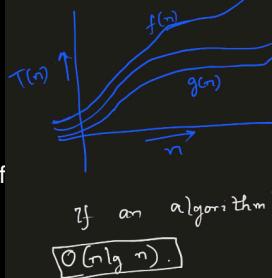
	total	used	free	shared	buffers	cached
Mem:	509336	462216	47120	0	71408	215684
-/+ buffers/cache:	175124	334212				
Swap:	915664	11928	903736			

/*free command without any option shows the used and free space of swap and physical memory in KB */

42. Define space and time complexity

After designing an Algorithm, it must be analyzed. A mathematical derivation of its execution time.

e.g. Insertion sort on average, increases following $\propto - n^2$, where n is the size of array. If array size is n , its execution time will be $(C_1n^2 + C_2n + C_3)$. This is called $\Theta(n^2)$.



$T(n) = O(f(n)) \rightarrow$ upper bound

$T(n) = \Omega(g(n)) \rightarrow$ lower bound

$T(n) = \Theta(g(n)) \rightarrow$ exact bound

if and only if $T(n) = O(g(n))$ and $T(n) = \Omega(g(n))$

$\lg n = \log_2 n$

Time Complexity: The time complexity of an algorithm quantifies the amount of time taken by an algorithm to run as a function of the length of the input. Note that the time to run is a function of the length of the input and not the actual execution time of the machine on which the algorithm is running on.

Space Complexity: The space complexity of an algorithm quantifies the amount of space taken by an algorithm to run as a function of the length of the input.

43.explain different shapes in a flowchart

The various symbols used in a flowchart are:

Arrows - Acts as connectors of all other symbols.

Oval - To indicate the entry and exit points of the flowchart.

Rectangle - To show processing steps like calculations or an action to be performed.

Parallelogram - To accept an input or display an output.

Diamond - Decision making step. Generally, there are two outward connectors from this symbol. The path is chosen based on the decision of the logical computation.

Circle - If a flowchart does not fit in the available space, and needs to be broken at a point. An alphanumeric symbol within a circle can be used as the breaking and continuing symbol for that flowchart.

